VOLUME XXIII MAY 1930 NUMBER 5

Southern Medical Journal

Journal of the Southern Medical Association

Published monthly by the Southern Medical Association, Empire Building, Birmingham, Ala. Annual subscription $4.00. Entered as Second-Class Matter at the Post Office at Birmingham, Ala., under act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Sec. 1103, Act of Oct. 3, 1917, authorized Dec. 20, 1921.

SOUTHERN MEDICAL ASSOCIATION, Twenty-Fourth Annual Meeting, Louisville, Kentucky, November 12-14, 1930. Pre-Meeting Clinics, November 11, 1930

TABLE OF CONTENTS

A Group of Patients Suffering from Paralysis Due to Drinking Jamaica Ginger. C. R. Bennett, Meridian, Miss. 371

Jamaica Ginger Paralysis (A Peripheral Polyneuritis). Seale Harris, Jr., Birmingham, Ala. 375

The Nature and Treatment of Cardiac Fatigue. Tinsley Randolph Harrison, J. Alfred Calhoun and Cobb Pilcher, Nashville, Tenn. 381

Injection Method of Treating Varicose Veins: Reasons for Its Popularity. Bertram M. Bernheim, Baltimore, Md. 386

The Management of Eclampsia in the Negro Race. C. B. Upshaw, Atlanta, Ga. 388

Cesarean Section Under Spinal Anesthesia in the Late Toxemias of Pregnancy. Herman W. Johnson and Robert A. Johnston, Houston, Tex. 390

Symposium on Eclampsia, Papers of Dr. King, Drs. Schwarz and Dorsett, Dr. Upshaw and Drs. Johnson and Johnston, discussed by Percy W. Toombs, Memphis, Tenn.; Warren E. Massey, Dallas, Tex.; Joseph E. Green, Richton, Miss.; Robert L. DeNormandie, Boston, Mass.; J. Bay Jacobs, Washington, D. C.; Lester A. Wilson, Charleston, S. C.; T. B. Sellers, New Orleans, La.; E. L. King, New Orleans, La.; Otto H. Schwarz, St. Louis, Mo.; C. B. Upshaw, Atlanta, Ga.; Herman W. Johnson, New Orleans, La.

A Method for Determining the Life Duration of the Erythrocyte: II. The Rate of Red Cell Production after Hemorrhage. Paul Eaton and F. L. Damren, Augusta, Ga. 395

Continued on Next Page

THE RECENT ADVANCES SERIES

A series of compact, well illustrated monographs presenting the late developments on each subject, providing supplementary material to any medical text.

Each Volume, Cloth $3.50. Sold Separately.

Psychiatry
Neurology
Medicine
Surgery
Anatomy
Obstetrics and Gynecology
Biochemistry
Preventive Medicine
Tropical Medicine
Bacteriology and Infections
Haematology
Physiology
Pediatrics
Ophthalmology
Cardiology
Tuberculosis
Plant Physiology

Send orders to

New Orleans J. A. MAJORS COMPANY Dallas

TABLE OF CONTENTS—Concluded

Chronic Hypoglycemia. H. M. Winans, Dallas, Tex. 402
Discussed by W. E. Vest, Huntington, W. Va.; T. L. Byrd, Atlanta, Ga.

The Relationship Between Mind and Brain in the Light of Epidemic Encephalitis. Foster Kennedy, New York, N. Y. 406

Traumatic Rupture of Pancreas with Secondary Fistula; Spontaneous Recovery. Eugene B. Maxwell, Miami, Fla. 409

Pelvic Endometriosis: Relative Merits of Various Methods of Treatment. Cayetano Panettiere, Miami Beach, Fla. 411

Malignant Hypertension, A Critique, with Remarks on the Nature of Hypertension. Wallace M. Yater, Washington, D. C. 413

SYMPOSIUM ON MALARIA

Recent Developments in the Control of Malaria. W. E. Deeks, New York, N. Y. 417

The Administration of Quinine by Rectum in the Treatment of Malaria. K. P. A. Taylor, Quirigua, Guatemala 420

Malaria and Hookworm in Venezuela. J. B. Ascanio-Rodriguez, Caracas, Venezuela 426

Hookworm and Malaria. Henry Hanson, Jacksonville, Fla. 426
Discussed by V. H. Bassett, Savannah, Ga.; W. S. Leathers, Nashville, Tenn.; A. T. McCormack, Louisville, Ky.

Malaria Control by Use of Paris Green: Preliminary Report on County-Wide Work in Dougherty County, Georgia. T. H. D. Griffitts, Albany, Ga. 428
Discussed by J. A. Ferrell, New York, N. Y.; L. M. Clarkson, Atlanta, Ga.; Noble A. Upchurch, Jacksonville, Fla.; Howard R. Fullerton, Nashville, Tenn.; Harry G. Grant, Richmond, Va.; C. A. Mohr, Mobile, Ala.; B. J. Lloyd, Washington, D. C.; W. E. Deeks, New York, N. Y.; Henry Hanson, Jacksonville, Fla.; M. A. Fort, Bainbridge, Ga.

Further Observations on the Malaria Problem of West Tennessee. Henry E. Meleney, Nashville, Tenn., Eugene L. Bishop, Nashville, Tenn., and Frank L. Roberts, Trenton, Tenn. 435

Report of a Malaria Survey and Control Methods on Lake Murray, Columbia, S. C. L. T. Coggeshall, Columbia, S. C. 442
Discussed by A. E. Legare, Columbia, S. C.; E. L. Filby, Jacksonville, Fla.; A. T. McCormack, Louisville, Ky.; T. H. D. Griffitts, Albany, Ga.; L. M. Clarkson, Atlanta, Ga.

Recent Observations on Malaria and Anopheles in the Philippines. W. V. King, Mound, La. 445
Discussed by Jacob Fajardo, Manila, P. I.; V. G. Heiser, New York, N. Y.

Malaria in Porto Rico in Its Relation to the Cultivation of Sugar Cane. W. C. Earle, New York, N. Y. 449
Discussed by W. E. Deeks, New York, N. Y.; William A. Boyd, Columbia, S. C.; Herbert C. Clark, Panama; Dalferes P. Curry, Panama, Canal Zone.

Malaria Control in Haiti. S. S. Cook, Port-au-Prince, Haiti 454
Discussed by Mark F. Boyd, Jackson, Miss.; Henry E. Meleney, Nashville, Tenn.

Malaria in Haiti. Frederick L. Hoffman, Wellesley Hills, Mass. 459

Malaria Control in Alabama, 1928. Stuart Graves, Montgomery, Ala. 462

Malaria Control in Georgia. L. M. Clarkson, Atlanta, Ga. 462

Malaria Control in Mississippi During 1929. Mark F. Boyd, Jackson, Miss. 463

Malaria Control Work in Missouri, 1929. W. S. Petty, Jefferson City, Mo. 464

Malaria Control Activities in North Carolina. Chas. O'H. Laughinghouse, Raleigh, N. C. 465

Malaria Activities in South Carolina. A. E. Legare, Columbia, S.C. 465

Malaria Control Activities in Tennessee, 1929. E. L. Bishop, Nashville, Tenn. 466

Malaria in Virginia. Harry G. Grant, Richmond, Va. 467

Malaria Work. John A. Ferrell, New York, N. Y. 468

Field Investigations of Malaria. E. R. Coffey, Richmond, Va. 648

The Aims and Objectives of the Gulf and South Atlantic Anti-Mosquito Congress. Hon. Harry T. Hartwell, Mobile, Ala. 468
Discussed by George N. MacDonell, Miami, Fla.; T. H. D. Griffitts, Albany, Ga.

EDITORIALS 470
Malaria in the South
Aluminum in Plants and Animals
Increasing the Rate of Ovulation
Dr. G. C. Savage—In Memoriam.

LOUISVILLE—WHERE WE MEET 473
The Convention City and Its Vicinity

BOOK REVIEWS 474

SOUTHERN MEDICAL NEWS 477

LABORATORIES OF

Drs. Bunce, Landham and Klugh

GEORGE F. KLUGH, M.D., Director Laboratory of Clinical Pathology
JACKSON W. LANDHAM, M. D., Director Laboratory of Radiology (X-Ray and Radium)

Pathology, Bacteriology, Serology, Metabolism, Chemistry, Electrocardiography, X-Ray and Radium

139 Forrest Ave., N. E. **ATLANTA, GA.**

Approved by the Council on Medical Education and Hospitals of the American Medical Association.

Clinical Conference

BY

St. Louis Clinics

TO BE HELD IN

St. Louis, Missouri

FROM

June 9th to June 21st Inclusive

The conference will consist of lectures, demonstrations, clinics and round-table luncheon discussions on medical and surgical subjects of interest to the general practitioner. Local clinicians of recognized ability will conduct the conference. Clinicians of national and international prominence in their respective fields have consented to participate.

Nominal registration fee.

Preliminary program available by addressing

St. Louis Clinics

3839 Lindell Boulevard, St. Louis Mo.

UNDULANT FEVER

Announcing
The Second Edition
of
Bulmer's Illustrated Monograph

Summarizes in correlated form the latest knowledge on all phases of the problem of undulant fever and contagious abortion, gained in an intensive search of authentic literature of this country and abroad. Endorsed by the foremost authorities upon this subject of importance to all physicians. Price $1.60

By
L. C. Bulmer, B.S., N.D.D. (Eng.),
Jefferson County Board of Health,
Birmingham, Ala.

Order From
THE TECHNICAL SERVICE BUREAU
Martin Building
Birmingham, Alabama

Trade Mark Reg.

ANESTHETIC GASES and EQUIPMENT

Nitrous Oxide
Oxygen
Ethylene
Hydrogen
Carbon Dioxide
Carbon Dioxide and Oxygen Mixtures

REGULATORS
Bedside Stand Inhaling Outfits
Bronze Memorial Tablets
Leading Makes of Anesthetic Apparatus

THE "PURITAN MAID TRADE MARK" IN ANESTHETIC GASES AND EQUIPMENT IS THE HALL MARK FOR PURITY OF PRODUCTS AND EFFICIENCY OF SERVICE.

KANSAS CITY OXYGEN GAS CO.

BALTIMORE, MD. Race and McComas Sts.
KANSAS CITY, MO. 2012 Grand Ave.
CHICAGO, ILL. 1660 So. Ogden Ave.
CINCINNATI, OHIO 6th and Baymiller Sts.
ST. PAUL, MINN. 810 Cromwell Ave.
ST. LOUIS, MO. 4578 Laclede Ave.
DETROIT, MICH. 455 Canfield Ave. E.

New 6th Revised Edition

Physiology and Biochemistry In Modern Medicine

1074 pages, 6½ x 9½ with 295 illustrations, including halftones and line drawings, and 9 color plates.
Price, silk cloth, $11.00.

By J. J. R. MACLEOD
M.B., LL.D. (ABER.), D.Sc., (TOR.), F.R.S.

Regius Professor of Physiology, University of Aberdeen, Scotland, Formerly Professor of Physiology in the University of Toronto; Formerly Professor of Physiology in the Western Reserve University.

Assisted by

Roy G. Pearce, A. C. Redfield, N. B. Taylor, J. M. D. Olmstead and by Others.

6th Revised Edition

Few medical books published in recent years have achieved the popularity of this one. Physicians and teachers have found it of invaluable aid in their daily work. The new 6th edition has been thoroughly revised, many sections have been completely rewritten, with new illustrations added.

New 2nd Revised Edition

Minor Surgery

By A. E. Hertzler, M.D., F.A.C.S., Chief Surgeon to Halstead Hospital, and Victor E. Chesky, M.D., F.A.C.S., Chief Resident Surgeon to Halstead Hospital. 2nd Ed. 602 pages, 475 illustrations. Cloth, $10.00.

A valuable book for the general practitioner, surgeon, and dispensary student. The new edition has been completely revised and many new cuts have been added. The illustrations form a special feature and are all original.

Send your order today.

The C. V. Mosby Company
Publishers
3523 Pine Blvd. ST. LOUIS, MO.

LIPPINCOTT BOOKS

MANUAL OF

PHYSICAL

AND

CLINICAL

DIAGNOSIS

By DR. OTTO SEIFERT, late Professor of Medicine, Wurzburg, and

DR. FRIEDRICH MUELLER, Professor of Medicine, II Med. Clinic, Munich.

Authorized Translation from the Twenty-fourth German Edition by E. COWLES ANDRUS, M.D., Associate in Medicine, Johns Hopkins University; Associate Physician, Johns Hopkins Hospital.

543 Pages, 140 Illustrations, 3 Colored Inserts
Flexible Keratol, $6.00

A WORK on diagnostic methods by the master and great clinical teacher, Friedrich Mueller, needs no recommendation from anyone.

The twenty-four editions in the German language and the numerous editions in seven other languages attest to the value of this compendium of diagnostic methods and data.

American medical students, internes and practitioners should feel very grateful to Dr. Andrus for translating this outstanding work.

Every interne and clinical clerk should carry a copy in his white coat to be available when working on the wards or in the clinical laboratory.

The student who has had a course of lectures on physical diagnosis and on clinical microscopy and chemistry will find that this little book is all that he will usually need to consult in his work on the wards.

The practitioner of medicine who has a copy on his desk will only rarely have to consult any other work on diagnostic methods and data.

LIPPINCOTT BOOKS

AN ABSTRACT

Smith, D. C.,* and Baker, J. W.: Sodium Bismuth Tartrate in Syphilis: Report of Six Cases. Southern Med. Journal, 23:188 (March) 1930.

There are a number of objections to the use of oily and aqueous suspensions of bismuth. The rate of absorption cannot be controlled or known and embolism can result. Bismuth Sodium Tartrate (Searle) has the advantage of being rapidly and regularly absorbed; it is stable in aqueous solution; its use is not followed by untoward reactions such as sore hips and toxic manifestations.

Using doses of 0.030 Gm. in 2 c c. of water at intervals of one or two days, in all cases there was demonstrable clinical improvement and, in four cases where dark field examinations were made at twenty-four hour intervals, the lesions were found free from spirochetes on an average of twenty-four hours after the fourth injection. With the exception of one case receiving fourteen injections within a period of twenty days, no toxic effects were observed. This one case developed a gingival blue line unassociated with foul breath or other symptoms. Sore hips were complained of by two patients but not to the degree frequently noticed in the administration of bismuth suspensions and in no case was there local induration or redness.

*Associate Professor of Dermatology and Syphilology, University of Virginia. This paper was read before the Southern Medical Associatiion at Miami, Florda, November 19-22, 1929.

Here Is Further Corroborative Evidence for the Claims We Have Advanced for

Water-Soluble

BISMUTH SODIUM TARTRATE

(Searle)

It is strongly spirocheticidal; it is relatively free from toxicity; it causes little or no pain, induration and tumefaction when intramuscularly injected in aqueous solution.

G. D. SEARLE & CO.

CHICAGO

—Makers of Arsenicals (Searle) which are free from Methyl Alcohol, Methyl Derivatives and Ether

HAY FEVER

An Advertising Statement

HAY FEVER, as it occurs throughout the United States, is actually *perennial* rather than *seasonal*, in character.

Because in the Southwest—Bermuda grass, for instance, continues to flower until December when the mountain cedar, of many victims, starts to shed its pollen in Northern Texas and so continues into February. At that time, elsewhere in the South, the oak, birch, pecan, hickory and other trees begin to contribute their respective quotas of atmospheric pollen.

But, nevertheless, hay fever in the Northern States at least, is in fact seasonal in character and of three types, viz.:

TREE HAY FEVER—*March, April and May*
GRASS HAY FEVER—*May, June and July*
WEED HAY FEVER — *August to Frost*

And this last, the late summer type, is usually the most serious and difficult to treat as partly due to the greater diversity of late summer pollens as regionally dispersed.

With the above before us, as to the several types of regional and seasonal hay fever, it is important to emphasize that Arlco-Pollen Extracts *for diagnosis and treatment* cover adequately and accurately all sections and all seasons—North, East, South and West.

FOR DIAGNOSIS *each pollen is supplied in individual extract only.*

FOR TREATMENT *each pollen is supplied in individual treatment set.*

ALSO FOR TREATMENT we have a few logically conceived and scientifically justified mixtures of biologically related and simultaneously pollinating plants. Hence, in these mixtures the several pollens are mutually helpful in building the desired group tolerance.

IF UNAVAILABLE LOCALLY THESE EXTRACTS
WILL BE DELIVERED DIRECT POST PAID
SPECIAL DELIVERY

List and prices of food, epidermal, incidental and pollen proteins sent on request

THE ARLINGTON CHEMICAL COMPANY
YONKERS, N. Y.

✓Checking up on SIMILAC

A DIET FOR INFANTS

✓

COMPOSITION

Every element of cow's milk has been modified or rearranged in Similac, so as to make it conform to the physical, chemical and metabolic requirements of infants deprived, either wholly or in part, of breast milk.

✓

FEEDING THE NEWLY-BORN

Feeding Similac during the newly-born period aids in preventing initial loss in weight and inanition fever.

✓

COMPLEMENTAL FEEDINGS

Used either as a complement to mother's milk, or as a complete diet for those infants deprived of breast milk, Similac dependably nourishes from birth onward.

✓

WEANING

The weaning from breast to bottle is made easier when Similac is fed as a complete diet.

SIMPLICITY

✓

For a complemental feeding, or a complete feeding for the infant wholly deprived of breast milk, simply add Similac to previously boiled water, in the proportion of one measureful of Similac to two ounces of water. Each can contains a measure.

SEND PRESCRIPTION BLANK FOR SAMPLES

M&R DIETETIC LABORATORIES, INC.

COLUMBUS, OHIO

Not "an hour or two" before retiring but just as you need it . . . .

How swiftly and surely the Roche hypnotic, Elixir Alurate, solves the problem of sleeplessness; yet how safely!

With Elixir Alurate available, physicians need no longer order a sleep-inducing remedy far in advance of bedtime. "An hour or two", as most of the labels say, is obviously an hour or two before anyone knows whether an hypnotic will actually be needed. Should not sleep be given a chance to come naturally?

Elixir Alurate, on the other hand, acts within a very few minutes. It is effective with a promptness that is ideal in an hypnotic agent; yet, with a smoothness that insures remarkably calm, recuperative sleep.

For quick action and refreshing sleep of the right quality, order—

Elixir Alurate

A trial supply of this safe, non-narcotic sedative-hypnotic sent to physicians on request

Hoffmann-La Roche, Inc.
Makers of Medicines of Rare Quality
NUTLEY NEW JERSEY

Feeding the Well Baby

IN DIRECTING the preparation of food for the baby, who must have nourishment other than human milk, the physician selects cow's milk as the basis of the procedure and then adopts some means calculated to assure its ready digestibility and to adjust the elements of milk to conform, as near as possible, to the nutritive requirements of early life.

Mellin's Food provides the means of carrying out what the physician desires to accomplish, for Mellin's Food assists materially in the digestion of milk and contributes elements needed for readjustment.

ACCEPTED AMERICAN MEDICAL ASSN. Committee on Foods

THERE *is no milk modifier exactly like Mellin's Food and the decided preference for this product by so many physicians is ample evidence that Mellin's Food possesses advantages that are outstanding.*

Mellin's Food changes the physical condition of the casein, making the curd soft and flocculent.

Mellin's Food favorably influences the digestibility of the cream of the milk.

Mellin's Food furnishes the extra carbohydrates needed and in a form (Maltose and Dextrins) particularly well suited to the infant's digestion.

Mellin's Food adjusts the mineral content of milk by adding the natural salts from wheat and barley and consisting of phosphorus, calcium, iron, magnesium, sodium and potassium, all readily utilized for the development of bone structure and for the regulation of various functions of the body.

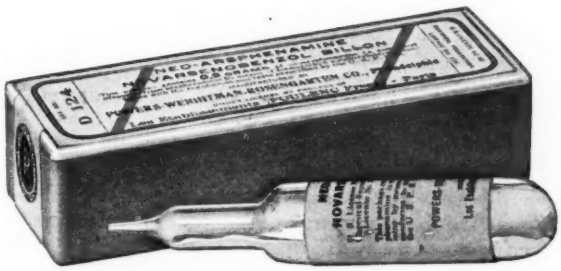
Definite in Composition

Mellin's Food
A MILK MODIFIER

Always Reliable

NOVARSENOBENZOL BILLON

(NEOARSPHENAMINE)



LES ETABLISSEMENTS POULENC FRERES, Paris

Originators

The American production is identical with the French. Orders repeated with increasing quantities, emphasize the unqualified approval of Novarsenobenzol Billon since its re-introduction into the United States.

MERCK & CO. INC.

Sole licensees to manufacture in the U. S. A.

SUCCESSORS TO

POWERS-WEIGHTMAN-ROSENGARTEN CO.

Literature on request to Philadelphia Office, 916 Parrish St.

HOSPITAL DIET *and* DECUBITAL ULCERS

In relation to Vitamine B *of the food*

IN STUDIES of decubital ulcers, Drs. Cowgill, Stucky and Rose (Yale Univ. Med. Sch.) state:

"These observations may prove of clinical value. As is well known, chronic invalids subsisting on a 'hospital' diet are particularly prone to develop decubital ulcers, which are discouragingly resistant to treatment by the usual methods employed. Our observations suggest that more attention should be paid to the content of Vitamine-B in the diets used in such cases. *Concentrates of Vitamine-B are now available commercially. Such preparations added to the routine diet may possibly prove of therapeutic value, and will probably improve the patient's appetite. In this way, the general nutritive state of the patient may be improved and healing favored."

Curiously, these cutaneous symptoms, seen as ulcers, have been related to the similarity of skin lesions in pellagra and various types of Herpes.

OBVIOUS DEDUCTIONS

DECUBITAL ULCERS These were apparently caused by a prolonged diet, deficient in its make-up of Vitamine-B complex, since they were cured by Yeast Vitamine-B (Harris) Concentrate.

PELLAGRA This is essentially attributed to deficiency of "P-P" and Vitamine "G" factors of the diet. The remedy of the U. S. Public Health Service, as published by the late Dr. Jos. Goldberger, is Brewers' Yeast-Harris, pasteurized powder —rich in vitamines "P-P" and "G".

HERPES Dr. H. J. Gerstenberger (Lakeside Hosp., Cleveland) has reported successful treatment of Herpetic Stomatitis and Herpes Labialis, with daily feeding of Yeast Vitamine-B Tablets (Harris).

*Yeast Vitamine-B Harris was used successfully with certain of these cases.

THE HARRIS LABORATORIES

TUCKAHOE TESTED H L STANDARDS NEW YORK

Typhoid Fever Is Preventable

Immunization of millions of soldiers against typhoid during the World War proved that the use of typhoid vaccine is a safe, simple, and effective measure. Its use should be extended to protect those who may be exposed to infected water, milk, or food.

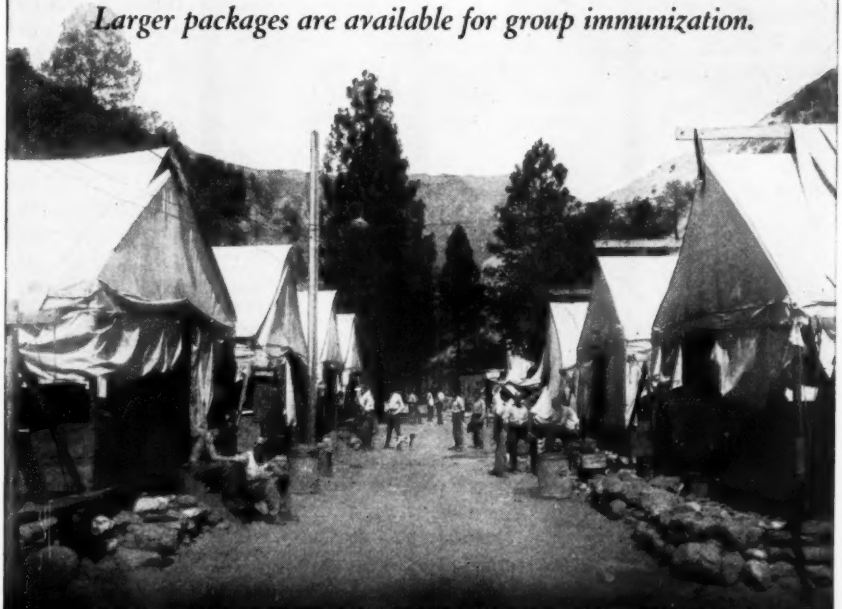
Typhoid Mixed Vaccine

LILLY

SPECIFY THROUGH YOUR DRUGGIST

V 760 Three 1 cc. vials for complete immunization of one patient.

Larger packages are available for group immunization.



FOR PAMPHLET CONTAINING INFORMATION OF IMMUNIZATION AGAINST TYPHOID FEVER WRITE

Eli Lilly and Company, Indianapolis, U·S·A

SQUIBB'S VITAMIN PRODUCTS

Since the earliest research on vitamins, E. R. Squibb & Sons has been actively engaged in studying the importance of these factors to the physician. Squibb was among the first to develop products which contained these factors for prophylactic and therapeutic uses. Squibb Vitamin Products are available for almost all professional needs. Here at a glance are given their content and use.

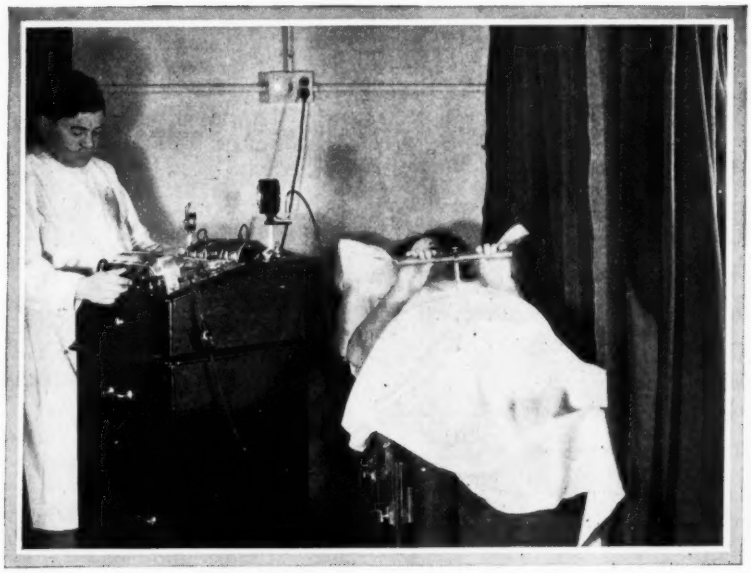
VITAMIN B	VITAMIN B	VITAMIN D	VITAMINS A & D
SQUIBB'S VITAVOSE	**SQUIBB'S DEXTRO-VITAVOSE**	**SQUIBB'S VIOSTEROL** IN OIL-100 D	**SQUIBB'S COD-LIVER OIL** WITH VIOSTEROL 5D
A palatable maltose-dextrin preparation, exceedingly rich in Vitamin B and assimilable iron salts. Stimulates the appetite. For modification of milk in infant feeding, and as a diet supplement.	A sweetened and readily soluble form of Vitavose in which the carbohydrate (dextrose) content has been materially increased. For the modification of cow's milk for very young infants, especially those with gastro-intestinal disturbances.	A specific for rickets, tetany, osteomalacia. Irradiated ergosterol in Oil, guaranteed to contain 100 times the Vitamin D potency of Cod-Liver Oil, as defined by the Wisconsin Alumni Research Foundation.	Squibb's regular Vitamin-Tested and Vitamin-Protected Cod-Liver Oil with the Vitamin D content increased by the addition of Viosterol so that it has five times the antirachitic strength of standard cod-liver oil.

SERENIUM SQUIBB—*A new product for the oral treatment of Genito-Urinary Infections. Combines low toxicity and high bacteriostatic activity.*

All Squibb Vitamin Products are accepted by the Council on Pharmacy and Chemistry of the A. M. A.

E·R·SQUIBB & SONS, NEW YORK

MANUFACTURING CHEMISTS TO THE MEDICAL PROFESSION SINCE 1858



When is Diathermy of Value in Your Practice?

YOUR decision to use diathermy in the treatment of any condition will, of course, be based on recognized medical authority. Many physicians have become interested as a result of observing the many references to diathermy in current medical literature, and no doubt intend to investigate for themselves when opportunity presents. But a busy practice affords little of the time required in searching the files of the medical library, and so it is put off indefinitely.

A preliminary survey of articles on diathermy, published during the past year or so, is available to you in the form of a 64-page booklet entitled "Indications for Diathermy." In this booklet you will find over 250 abstracts and extracts from articles by American and foreign authorities, including references to more than a hundred conditions, in the treatment of which the use of diathermy is discussed.

If you number yourself among the physicians who have not yet adopted diathermy in practice, and desire to investigate this form of therapy in view of reaching your own conclusion as to its value in your practice, you will find this booklet a convenient reference. A copy will be sent on request.

GENERAL ELECTRIC X-RAY CORPORATION

2012 Jackson Boulevard Chicago, Ill., U.S.A.

FORMERLY VICTOR X-RAY CORPORATION

Join us in the General Electric Hour broadcast every Saturday night on a nationwide N. B. C. network.

General Electric X-Ray Corporation
2012 Jackson Blvd., Chicago.

Not being a user of diathermy in my practice, please send your 64-page booklet "Indications for Diathermy."

Dr......

Address.....

City..... *State*.....

Sugar belongs in the diet ... ASK YOUR DOCTOR!

THIS is one of the advertisements of The Sugar Institute, appearing in newspapers throughout the country. In order to keep the statements in accord with modern medical practice, they have been submitted to and approved by some of the leading authorities in the field of human nutrition in the United States.

"Sugar makes essential foods, which have roughage, minerals and vitamins, more palatable."

SHOULD SUGAR HAVE A PLACE IN THE DIET? Here are some interesting facts — information which your doctor would give you.

Sugar is a preferred fuel food. When eaten in any form, it combines with oxygen in the body. Seventy-five per cent of its energy goes into heat and the rest supplies power to the muscles.

Sugar makes essential foods, which are the vehicles or carriers of roughage, mineral salts and vitamins, more palatable. It modifies harsh acids, heightens bland flavors

Consider how many fruits and vegetables that you eat are sweet. How unpleasant they would be without this palatable flavor. Often, however, certain familiar vegetables lose the sweetness they possessed when fresh picked, because their sugar has been converted into starch. In such cases it is proper to add a dash of sugar in cooking them to restore their original flavor.

Think of these facts as you plan your meals. And in addition to using sugar as a flavor remember that simple wholesome desserts have their place in balanced meals. The normal diet calls for sugar. Ask your doctor! The Sugar Institute.

"Good food promotes good health"

TO THE PHYSICIANS OF ALABAMA

RABIES VACCINE

(Semple Treatment—14 Doses)

The Semple Anti-Rabic Treatment has the advantages of being easier to administer than the other treatments, since the doses are already prepared and in the syringes, ready to inject.

Since the period of incubation in Rabies is sometimes as short as fourteen days, this treatment affords a better opportunity for an early development of immunity.

Gilliland Biological Products are supplied under contract with Alabama State Board of Health.

U. S. Government License No. 63

TETANUS ANTITOXIN

(Concentrated and Refined)

Tetanus Antitoxin (Gilliland), as supplied under the contract with Alabama State Board of Health, is Ultra-concentrated. It is lower in volume with the smallest content of protein and total solids, thus minimizing the risk of serum reactions.

It is furnished in our improved syringe containers, ready for immediate use.

Order through your local distributor or direct from the Antitoxin Division, State Board of Health, Montgomery, Alabama.

SMALL-POX VACCINE

Gilliland Small-pox Vaccine may be relied upon at all times, it being a pure and safe product of guaranteed potency.

It is furnished in clear glass capillary tubes, hermetically sealed, with sterile needles and rubber bulb for expelling the vaccine.

THE GILLILAND LABORATORIES

Marietta, Pa.

CRAWFORD CLINIC

SOUTH MISSISSIPPI INFIRMARY

HATTIESBURG, MISSISSIPPI

THE ATLANTA NEUROLOGICAL HOSPITAL

At

BROOK HAVEN MANOR

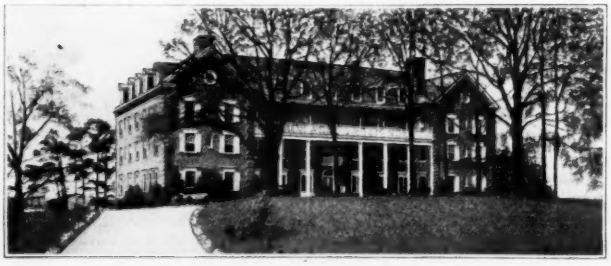
4070 Peachtree Road, ATLANTA, GEORGIA

NEWDIGATE M. OWENSBY, M. D.

Director

1210 Medical Arts Building Atlanta, Georgia

May We Send You A Booklet?



BLACKMAN HEALTH RESORT, Inc.,

2140 Peachtree Road, N. W., Atlanta, Ga.

General Medical

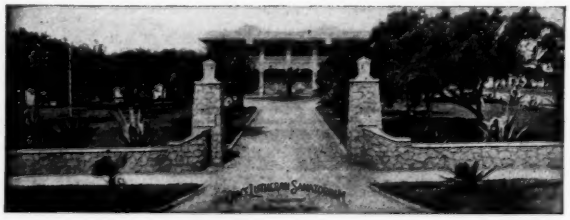
New, fireproof, finely appointed. Semi-rural setting in the best environs of Atlanta, one-half mile out. Rates average $50 per week, including the Baths and room with bath.

Elaborate hydrotherapy; complete diathermy-sinusoidal-ultra-violet-arc-infrared dep.; dietetics, colon lavage.

Clinical and X-ray laboratories.

Heart-artery-kidney, diabetic, digestive, rheumatic, nervous, toxic, anemic, underweight and overweight cases. Migraine. Angina.

GRACE LUTHERAN SANATORIUM



FOR TUBERCULOSIS

San Antonio, Texas

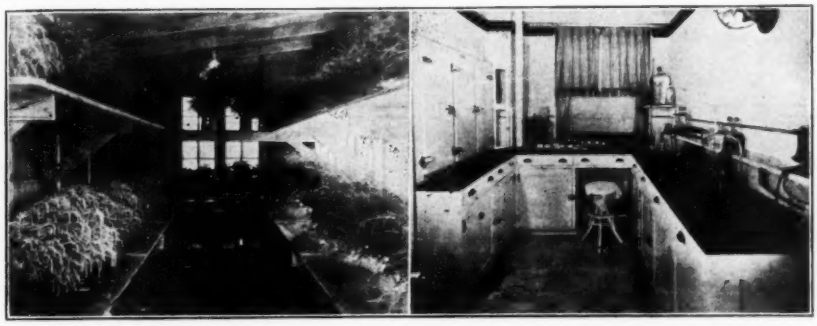
A MODERN institution in beautiful San Antonio. Climate unexcelled the year round for treatment of tuberculosis. Private rooms with bath and sleeping porch; individual cottages; high-class accommodations; Radiographic and Fluoroscopic service; complete medical staff; moderate rates. For booklet and information address

REV. PAUL F. HEIN, D.D., Supt.,
P. O. Box 214
SAN ANTONIO, TEXAS

BALYEAT HAY-FEVER AND ASTHMA CLINIC

Rooms 600-620 Osler Building, 1200 North Walker **Oklahoma City, Okla.**

Ray M. Balyeat, M.A., M.D., Director



Pollen House **Laboratory**

The Clinic is devoted exclusively to the study and treatment of asthma, hay-fever, and allied diseases (certain types of eczema, urticaria and migraine).

Patients referred to the Clinic will be thoroughly investigated, material for treatment prepared, and returned to their doctor for further care.

CHEVY CHASE SANATORIUM

Tennyson and 32nd Streets Washington, D. C.

For Mental and NERVOUS CONDITIONS

Full Staff of Consulting Specialists. Physician in Charge gives entire time to study and care of individual patients. Capacity limited and only selected cases admitted. Rooms private and comfortable. Seven acres of wooded lawn in exclusive residential section of Nation's Capital. Tennis courts, croquet courts, complete Hydro-Therapy equipment. Delightful environment and private home atmosphere, ideal for resting shattered nerves. Every effort is made to maintain the highest standard of efficiency and ethics. Rates, based on individual requirements, are in keeping with general hospital charges.

Maurice L. Townsend, M.D., Physician in Charge

WESTBROOK SANATORIUM

Richmond Telephone—Boulevard 1220 Virginia

Department for Men:
J. K. Hall, M. D.
O. B. Darden, M. D.

Department for Women:
P. V. Anderson, M. D.
J. H. Royster, M. D.
E. H. Alderman, M. D.

The institution is situated just beyond the northern border of the City on the Richmond-Washington automobile highway.

The scope of the work of the Sanatorium is limited to the diagnosis and the treatment of nervous and mental disorders and to the addictions to drugs and to alcohol. It affords also adequate facilities for rest and upbuilding under medical and nursing supervision.

The medical staff devotes its entire attention to the patients in the Sanatorium.

The institution maintains a school for trained attendants in which instruction in the care of the nervous and mentally sick is emphasized.

There are twelve separate buildings for patients, with 150 beds. Such a large group of buildings makes possible the more congenial grouping of patients. Rooms may be had single or en suite, with or without private bath. There are a few small cottages for the use of individual patients.

A comprehensive general physical and nervous examination is made of each patient. A mental examination is made when indicated. The examination is typed and a copy of it is available for the referring physician. Complete x-ray equipment has been installed. A dental room has been fitted up and a complete dental investigation is a part of the general survey.

A skilled teacher gives practical daily instruction to small groups in the arts and crafts. Helpful and interesting occupation in the out-of-doors is made possible for the men patients in the vegetable and flower gardens, on the truck farm, in the poultry yards, and in the dairy.

There are bowling, tennis, croquet, and pool. There is a movie and a dance every week. On Sunday evening there is chapel service.

Detailed information is available for physicians.

HIGH OAKS SANATORIUM

Established 1887

Lexington, Kentucky
1000 Feet Elevation

For the Treatment of Nervous and Mental Diseases, Liquor and Addictions

Every approved method of treatment applied as indicated after thorough clinical and laboratory examination of patient. Constant expert medical supervision and specially trained nurses. Complete hydrotherapeutic equipment. Although a fully equipped institution, the sanatorium has a comfortable, home-like atmosphere.

New brick buildings, rooms with and without private baths. Extensive, beautifully wooded grounds in the heart of the blue grass region; a short drive from the famous scenery of the Kentucky River.

Music. Billiards and pool, tennis, croquet and other in and outdoor games. Eighteen hole golf course available. Frequent automobile drives.

For complete information, address

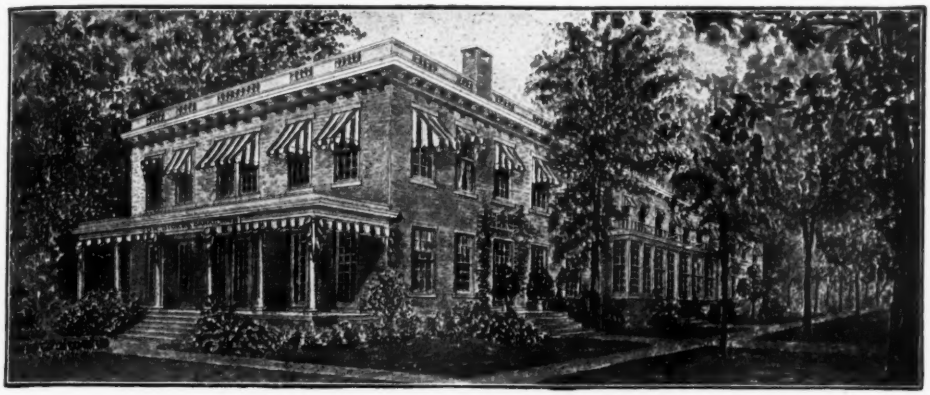
DR. GEO. P. SPRAGUE, Supt.

For
Alcoholism
Drug Addiction

A Strictly Modern Sanatorium
With Hospital Facilities

A quarter century of experience

For
Mental and
Nervous Diseases



The Five Acre Stokes Estate on Cherokee Road, Louisville, Ky.

Whiskey treatment destroys the craving for alcohol and builds the patient up physically and mentally. Drug treatment is one of gradual reduction; destroys craving for drug; withdrawal pains absent; no hyoscin or rapid withdrawal method used, unless desired by patient. Physicians refer nervous patients to us for observation after which they are returned to family physician. Mild mental cases often thought hopeless, are able to return home. Telephone East 1488. Address

Rates
on Request

DR. STOKES SANATORIUM

Long Distance
Phone, East 1488

E. W. STOKES, M. D., Medical Director, Cherokee Road, Louisville, Ky.

WM. RAY GRIFFIN, M.D. M. A. GRIFFIN, M.D.

APPALACHIAN HALL

ASHEVILLE, N. C.

For the Treatment of Nervous Diseases

Located in a beautiful park of twenty-five acres, in one of the famous all-the-year-round health resorts of the world, where climate, air, water and scenery are unsurpassed. Five separate buildings, thoroughly modern, afford ample facilities for the classification and separation of patients.

Treatment is limited to Nervous and Mental Diseases, Selected Cases of Alcoholic and Drug Habituation.

Hydro-therapy, Electro-therapy, Occupational-therapy and Massage extensively used. The two physicians in charge reside in the Institution and devote their entire time to the care and treatment of the patients.

For information booklet write Drs. Griffin and Griffin.

STUART CIRCLE HOSPITAL, Richmond, Va.

STAFF

General Surgery:
Robert C. Bryan, M.D., F.A.C.S.
Stuart N. Michaux, M.D., F.A.C.S.
Charles R. Robins, M.D., F.A.C.S.

Obstetrics:
Greer Baughman, M.D.
Ben H. Gray, M.D.

Internal Medicine:
Alex G. Brown, Jr., M. D.
Manfred Call, M.D.

Ophthalmology, Oto-Laryngology:
Clifton M. Miller, M.D.
R. H. Wright, M.D.

Physiotherapy:
Mark W. Peyser, M.D.

With consulting offices for the staff, laboratories, surgical and obstetrical operation rooms, equipment for the treatment of medical cases and a training school for nurses, the STUART CIRCLE HOSPITAL is a modern standardized hospital for private patients.

CHARLOTTE PFEIFFER, R. N., Superintendent.

DR. MOODY'S SANITARIUM

SAN ANTONIO, TEXAS

For Nervous and Mental Diseases, Drug and Alcohol Addiction and Nervous Invalids Needing Rest and Recuperation.

Established 1903. Strictly ethical. Location delightful summer and winter. Approved diagnostic and therapeutic methods. Modern clinical laboratory. Seven buildings, each with separate lawns, each featuring a small separate sanitarium, affording wholesome restfulness and recreation, in doors and out doors, tactful nursing and homelike comforts. Bath rooms en suite, 100 rooms, large galleries, modern equipment, 15 acres, 350 shade trees, cement walks, playgrounds. Surrounded by beautiful park, Government Post grounds and Country Club.

T. L. MOODY, M.D.
Supt. and Res. Physician.

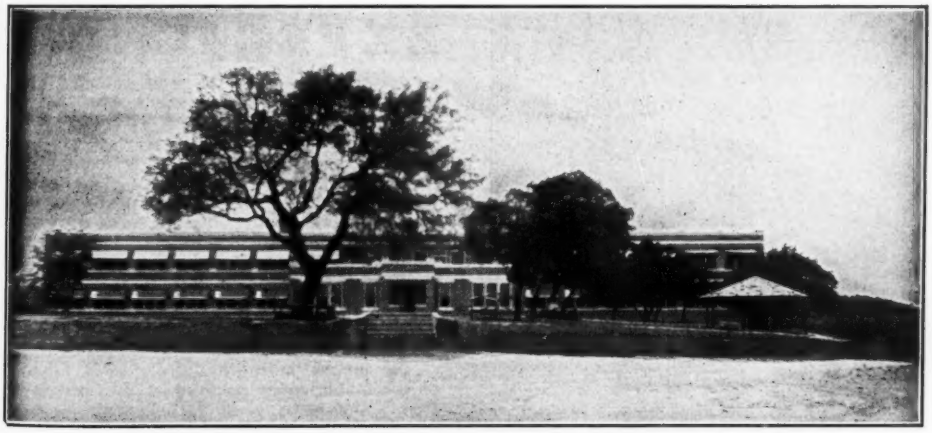
J. A. McINTOSH,
Res. Physician

HILL CREST SANITARIUM FOR NERVOUS AND MENTAL DISEASES AND SELECTED CASES OF ADDICTION

Hill Crest Sanitarium is ideally located on the crest of Higdon Hill on the proposed Scenic Highway overlooking the City. All modern conveniences. Separate buildings for convalescent women patients. Several acres of well shaded lawn. Adequate nursing service maintained. Consultants: H. S. Ward, M.D., C. M. Rudulph, M.D.

JAMES A. BECTON, M.D., Physician in Charge. P.O. Box 96, Woodlawn, Birmingham, Ala., Phone Wdl. 1200

SAM E. THOMPSON, M.D. H. Y. SWAYZE, M.D.



Main Building. There are 36 Hollow Tile Cottages with Modern Conveniences

THE THOMPSON SANATORIUM

KERRVILLE, TEXAS

FOR THE TREATMENT AND EDUCATION OF TUBERCULOUS PATIENTS

All Sealy Mattresses X-Ray and Laboratory Graduate Nurses Moderate Rates

Ideal all year climate. Seventy-five miles northwest of San Antonio—1400 feet higher.

WAUKESHA SPRINGS SANITARIUM

For the Care and Treatment of

NERVOUS DISEASES

Building Absolutely Fireproof

BYRON M. CAPLES, M.D., Medical Director
FLOYD W. APLIN, M.D.
L. H. PRINCE, M.D.

Waukesha, - - - Wisconsin

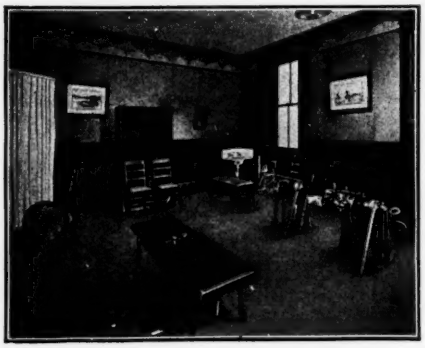
POTTENGER SANATORIUM

MONROVIA, CALIF.

for Diseases of the Lungs and Throat
F. M. Pottenger, A.M., M.D., L.L.D., Med. Director
J. E. Pottenger, A.B., M.D., Asst. Med. Director
and Chief of Laboratory
S. P. Bittner, M.D., Resident Physician

Situated on the Southern slope of the Sierra Madre Mountains at an elevation of 1,000 feet. Winters delightful; summers cool and pleasant. Thoroughly equipped for the scientific treatment of tuberculosis. A clinic for the diagnosis and study of such non-tuberculous diseases as asthma, lung abscess and bronchiectasis is maintained in connection with the Sanatorium.

Address POTTENGER SANATORIUM,
Monrovia, Calif., for particulars
Los Angeles Office,
1212-14 Wilshire Medical Building,
1930 Wilshire Boulevard



High Frequency and Light Room

All Forms of Lights, Mechanical Vibration and Swedish Movements are available at The Pope Hospital in the treatment of patients referred to this institution.

EXPERIENCE

THE Pope Hospital was founded in 1890 and the intervening years have found us keeping step with the best medical thought of the times.

This hospital is thoroughly equipped for the treatment of Neurological and Internal Medicine cases. Careful diagnosis and individual study of every case always precede treatment. Modern laboratory methods eliminate all risk of guesswork.

Our methods include: Hydrotherapy, Electrotherapy, Galvanic, Sinusoidal, Static, Thermotherapy, Mechanotherapy, Faradic, High Frequency and Diathermy.

No insane, morphine, alcoholic or other objectionable cases received at this institution. Complete co-operation with home physician always. For further information or copy of new booklet address

THE POPE HOSPITAL

Incorporated

LOUISVILLE, KY.

CURRAN POPE, M. D.
Medical Director

Ambler Heights Sanitarium

Conducted for incipient and convalescent tuberculous cases.

ASHEVILLE, N. C.

Equipment and methods rated (monthly average) 99% by the Asheville Board of Health for four years. Booklet and information upon request.

Address

DOCTORS AMBLER & AMBLER
P. O. Box 1861, Asheville

Seale Harris Clinic

GORGAS HOTEL HOSPITAL

For the diagnosis and treatment of internal diseases, particularly gastro-intestinal, cardio-vascular-renal, nervous (rest-cure cases) and metabolic diseases. Special ten day course of individual instruction for diabetics. Rates reasonable.

Physicians are cordially invited to visit the Clinic and Hospital at any time.

Advertised only to the medical profession.

Highland Avenue at Sycamore Street
BIRMINGHAM, ALABAMA

McGuire Clinic

ST. LUKE'S HOSPITAL

Richmond, Virginia.

Medical and Surgical Staff

General Medicine
James H. Smith, M. D.
Hunter H. McGuire, M.D.
Margaret Nolting, M.D.
John Powell Williams, M.D.
Kinloch Nelson, M.D.
Clifford H. Beach, M.D.

Pathology and Radiology
S. W. Budd, M.D.

Roentgenology
A. L. Gray, M.D.
J. L. Tabb, M.D.

Urology
Austin I. Dodson, M.D.

General Surgery
Stuart McGuire, M.D.
W. Lowndes Peple, M.D.
Carrington Williams, M.D.
W. R. Southward, Jr., M.D.

Orthopedic Surgery
William T. Graham, M.D.
D. M. Faulkner, M.D.

Dental Surgery
John Bell Williams, D.D.S.
Guy R. Harrison, D.D.S.

Eye, Ear, Nose and Throat
Thomas E. Hughes, M.D.

LYNNHURST SANITARIUM

FOR NERVOUS DISEASES AND MILD MENTAL DISORDERS

Situated in the suburbs of Memphis in a natural park comprising 28 acres of beautiful woodland and ornamental shrubbery. Modern and approved methods in construction and equipment. Sanitary plumbing, low-pressure steam heat, electric light, fire protection and an abundance of pure water. The elegance and comforts of a well appointed home. Rooms single or en suite with private bath. Facilities for giving Hydrotherapy, Electrotherapy, Massage, Physical Culture and Rest Treatment. Experienced nurses and house Physician. An improved treatment for Opium-Morphin Addiction.

S. T. RUCKER, M.D., Director Medical Department

Memphis, Tenn. Bell Telephone Connections

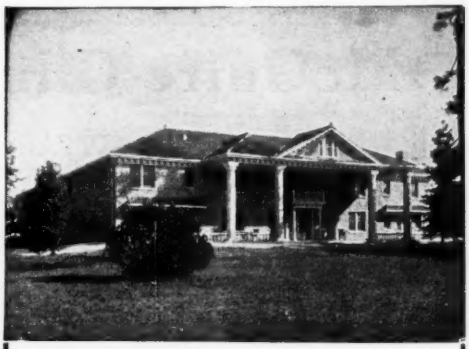
THE HENDRICKS-LAWS SANATORIUM

El Paso, Texas

Chas. M. Hendricks, James W. Laws,
Medical Directors

A modern and thoroughly equipped private institution for the treatment of all forms of tuberculosis, located at an ideal point, where atmospheric conditions approach perfection in the treatment of such disorders. For full information, address T. B. Craft, Business Manager.

Altitude 4,000 feet. Percentage of Humidity .40
335 Sunny Days. Average Rainfall 9.12 inches.



THE OXFORD RETREAT

OXFORD, OHIO

FOR

Nervous
and
Mild Mental Cases

R. HARVEY COOK
Physician in Chief

Write for Descriptive Circular

CITY VIEW SANITARIUM

For MENTAL and NERVOUS DISEASES and ADDICTIONS
ESTABLISHED IN 1907
AN ENTIRELY NEW PLANT ERECTED IN 1922

Separate buildings for men and women, ideally arranged and equipped with every facility for the comfort, care and treatment of the class of patients received. Situated in the midst of a fifty-acre tract, and surrounded by large groves and attractive lawns. Two resident physicians. Training school for nurses.

References: The medical profession of Nashville

NASHVILLE — JOHN W. STEVENS, M.D., Physician-in-Charge, R. F. D. No. 1 — TENNESSEE

On Murfreesboro Pike, one-half mile east of old location

BRAWNER'S SANITARIUM

ATLANTA, GEORGIA
For Mental and Nervous Diseases.

A modern neuropsychiatric hospital with special laboratory facilities for the study and treatment of early cases. Also a department for the treatment of drug and alcoholic addictions.

The Sanitarium is located on the Marietta Electric Car Line ten miles from the center of Atlanta, near Smyrna, Ga. The grounds comprise 80 acres. The buildings are steam heated, electrically lighted, and many rooms have private baths.

Address communications to Brawner's Sanitarium, Smyrna, Ga., or to the city office, 157 Forrest Avenue, N. E., Atlanta, Ga.

Dr. Jas. N. Brawner, Medical Director.
Dr. Albert F. Brawner, Resident Physician.

ARLINGTON HEIGHTS SANITARIUM

P. O. BOX 978, FORT WORTH, TEXAS

For Nervous Diseases and Selected Cases of Mental Diseases.

(Incorporated under laws of Texas)

BRUCE ALLISON, M.D.
Superintendent

JAS. D. BOZEMAN, M.D.
Resident Physician

DRS. W. L. ALLISON
and JNO. S. TURNER
Consultants

THE TUCKER SANATORIUM, INC.

212 WEST FRANKLIN STREET (Corner of Madison) RICHMOND, VIRGINIA

This is the Private Sanatorium for the Neurological Practice of Drs. Beverley R. Tucker, Howard R. Masters and James Asa Shield

The Tucker Sanatorium is for the treatment of nervous and endocrine diseases. There are departments of massage, medicinal exercises, hydrotherapy and physiotherapy. The Sanatorium is large and bright, surrounded by a lawn and shady walks, large verandas and has a roof garden. It is situated in the best part of Richmond and is thoroughly and modernly equipped. The nurses are specially trained in the care of nervous cases.

Insane and acute alcoholic cases are not taken.

St. Elizabeth's Hospital

RICHMOND, VA.

Staff

J. Shelton Horsley, M.D., Surgery and Gynecology
J. S. Horsley, Jr., M.D., Plastic, Thoracic and General Surgery.
Douglas C. Chapman, M.D., Internal Medicine
Wm. H. Higgins, M.D., Consultant in Internal Medicine
O. O. Ashworth, M.D., Consultant in Internal Medicine
Austin I. Dodson, M.D., Urology
Fred M. Hodges, M.D., Roentgenology
Thos. W. Wood, D.D.S., Dental Surgery
Helen Lorraine, Medical Illustration

Administration

N. E. Pate.....Business Manager

SCHOOL FOR NURSES

The Training School is affiliated with Johns Hopkins Hospital in Baltimore for a three months' course, each, in Pediatrics and Obstetrics. A course in Public Health Nursing is given as an elective in the Senior year at the Richmond School of Social Work and Public Health which is a department of William and Mary College. All applicants must be graduates of a high school or have the equivalent education.

Address

Elizabeth S. Moran, R. N.

Superintendent

Drs. Keith, Keith and Bell

746 Francis Bldg. Louisville, Ky.

Modern equipped X-Ray Laboratories at Office and Hospitals for Diagnosis and Therapy

An ample supply of Radium for the treatment of superficial and deep lesions in which radium is indicated.

J. PAUL KEITH D. Y. KEITH

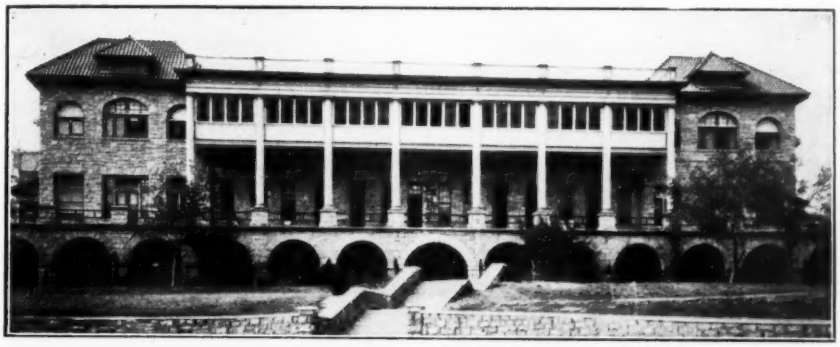
JOS. CLARK BELL

SAINT ALBANS SANATORIUM

RADFORD, VA.

Medical Staff:
J. C. KING, M.D.
IRA C. LONG, M.D.

A modern, ethical Institution, fully equipped for the diagnosis, care and treatment of medical neurological, mild mental and addiction cases. Ideal location, 2000 feet above sea level. Rates reasonable. Railway facilities excellent. Write for full details.



ST. JOSEPH'S SANATORIUM for Tuberculosis

El Paso, Texas

THE SISTERS OF ST. JOSEPH

W. L. Brown, M.D., F.A.C.S.
Surgery
Paul Gallagher, M.D.
Chest Surgery
K. D. Lynch, M.D.
Urology
F. C. Goodwin, M.D.
Orthopedist
L. B. Baltz, D.D.S.
Dental Surgery

E. A. Duncan, M.D.
Consultation
Internal Medicine
G. Werley, M.D.
Consultation
Internal Medicine
F. D. Garrett, M.D.
Gastroenterology
L. M. Smith, M.D.
Dermatologist

Stephen A. Schuster, M.D., F.A.C.S.
Franklin P. Schuster, M.D., F.A.C.S.
Ophthalmology and
Otolaryngology
J. W. Cathcart, M.D., F.A.C.S.
C. H. Mason, M.D.
Roentgenology
W. W. Waite, M.D.
Bacteriology and Pathology

D. G. Arnold, M.D.
Resident Internist

Orville E. Egbert, M.D.
Medical Director

M. M. Gibson, M.D.
Resident Internist

THE STEWART HOME TRAINING SCHOOL, Frankfort, Ky.

For the Care and Training of MENTALLY DEFECTIVE CHILDREN

Expert training, mental development and care by specially trained teachers, nurses and physician who has devoted his life to the study and treatment of cases of arrested mental development.

Delightfully located in the beautiful blue grass region of Kentucky. Five hundred acres of lawn and woodland for pleasure grounds. Seven elegantly appointed buildings, electrically lighted and steam heated. Highly endorsed by prominent physicians. Write for descriptive catalogue. Address

DR. JOHN P. STEWART
Box M, Frankfort, Ky.

THE WINYAH SANATORIUM

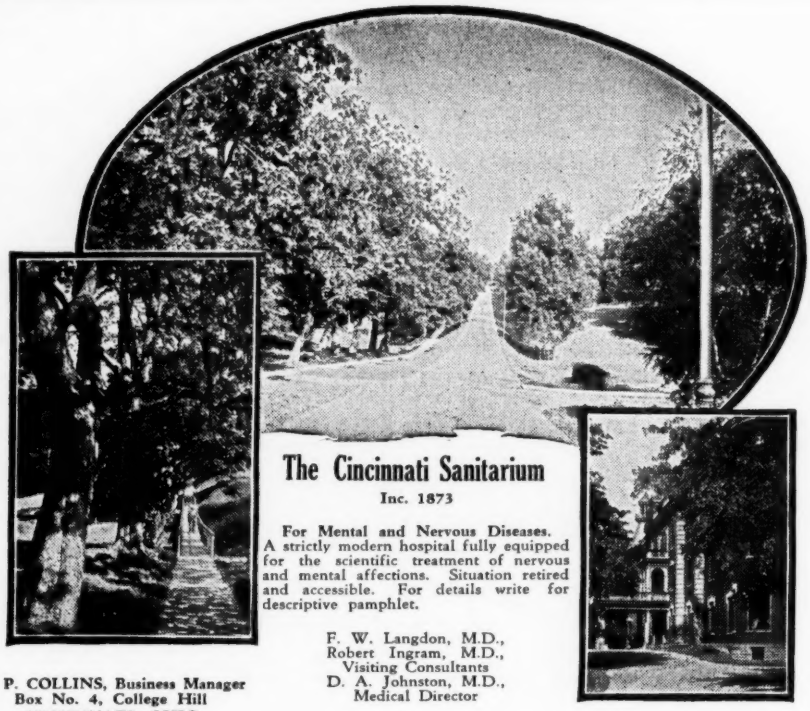
OPERATED BY THE VON RUCK MEMORIAL SANATORIUM, Inc.
Established in 1888 by Dr. Karl von Ruck
ASHEVILLE, N. C.

Medical Staff: Dr. R. E. Flack, Dr. Edw. W. Schoenheit, Dr. Louis Dienes

A modern and completely equipped institution for the treatment of tuberculosis. High-class accommodations. Strictly scientific methods. For particulars and rates write to

WM. A. SCHOENHEIT,
Business Manager.

(Please mention this Journal)



The Cincinnati Sanitarium

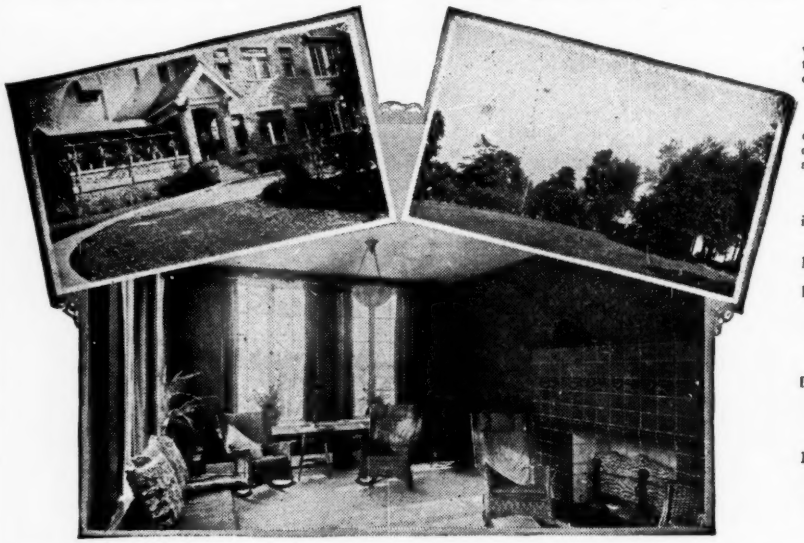
Inc. 1873

For Mental and Nervous Diseases. A strictly modern hospital fully equipped for the scientific treatment of nervous and mental affections. Situation retired and accessible. For details write for descriptive pamphlet.

F. W. Langdon, M.D.,
Robert Ingram, M.D.,
Visiting Consultants
D. A. Johnston, M.D.,
Medical Director

H. P. COLLINS, Business Manager
Box No. 4, College Hill
CINCINNATI, OHIO

"REST COTTAGE" Cottage Hill, Cincinnati, Ohio



For purely nervous cases, nutritional errors and convalescents.

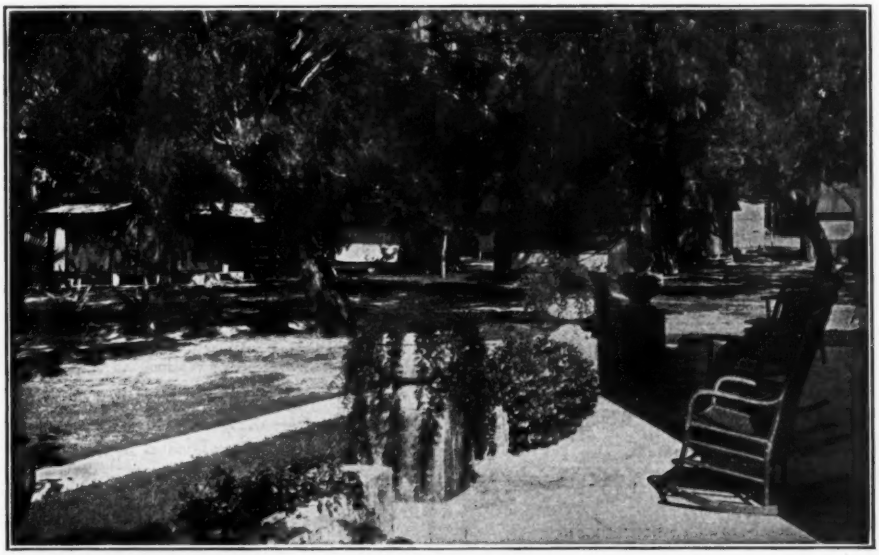
Completely equipped for hydrotherapy, massages, etc.

Cuisine to meet individual needs.

F. W. Langdon, M. D.
Robert Ingram, M. D.
Visiting Consultants.

D. A. Johnston, M.D., Medical Director.

H. P. Collins, Bus. Mgr., Box No. 4, College Hills, Cincinnati, Ohio.



VON ORMY COTTAGE SANITORIUM For the Treatment of Tuberculosis
VAN ORMY, TEXAS

W. R. GASTON, Manager F. C. COOL, Assistant Manager R. G. McCORKLE, M.D., Medical Director

Ideally located near San Antonio, Texas. An institution that offers the proper care of tuberculous patients at moderate rates. For Booklet and other information please address the Manager.

WALTER R. WALLACE, M.D. HUGH W. FRIDDY, M.D.

THE WALLACE SANITARIUM
MEMPHIS, TENN.
(SUCCEEDING THE WALLACE-SOMERVILLE SANITARIUM)

For the Treatment of Drug Addictions, Alcoholism, Mental and Nervous Diseases
Located in the Eastern Suburbs of the City—Sixteen Acres of Beautiful Grounds
All Equipment for Care of Patients Admitted

New York Post Graduate Medical School and Hospital

offers an eight months' course in

OTO-LARYNGOLOGY

Beginning June 1, 1930

Included in the course are: Anatomy and Physiology of the Nose, Throat and Ear; Embryology, Histology, Pathology, and Bacteriology of the Nose, Throat, and Ear (given by laboratory staff); Dissection of the Head and Neck, and Nose, Throat and Ear Operations (cadaver); Daily clinics in a large Out Patient Department; Bronchoscopy, Esophagoscopy, etc.

During the last few months the matriculate performs under supervision a number of the more common nose and throat operations in the out patient department.

The course may be followed by a four months course in Ophthalmology beginning February 1, 1931.

For descriptive booklet and further information address

The Dean, 306 East 20th Street, New York City

The Tulane University of Louisiana

GRADUATE SCHOOL OF MEDICINE

Approved by the Council on Medical Education of the A.M.A.

Post-graduate instruction offered in all branches of medicine. Courses leading to a higher degree have also been instituted.

A bulletin furnishing detailed information may be obtained upon application to the

DEAN
GRADUATE SCHOOL OF MEDICINE
1551 Canal Street
New Orleans, Louisiana

POST GRADUATE COURSES

in all branches for

PHYSICIANS AND SURGEONS

Special Courses in

EYE, EAR, NOSE AND THROAT

LABORATORY AND X-RAY

Training for

Physicians and Technicians

COURSES IN NERVOUS AND MENTAL DISEASES

Presentation of Clinic cases. History taking and personal examination of patients. Special arrangements made for the study of mental diseases. FEVER TREATMENT OF PARETICS demonstrated where available.

For further information address

Post Graduate Hospital and Medical School

2400 S. Dearborn St. Chicago, Ill.

Hospital For General Diagnosis and Nervous Diseases

"NORWAYS"

1820 E. 10th Street, Indianapolis, Ind.

An institution devoted to the Research, Study and Diagnosis of all problems in Medicine and Surgery, especially of conditions involving the Nervous System. All newer methods of Diagnosis, particularly the Chemistry of the blood, spinal fluid, secretions and excretions of the body are employed. The importance of the body metabolism and its relation to diseased conditions is emphasized.

The co-operation of physicians is invited. It is the policy of the Hospital to return patients to their home and family physician for treatment, at the earliest possible moment, after diagnosis is made. Only at the request of the patient's physician will any case be kept in the Hospital beyond the necessary period of observation.

A complete staff of skilled specialists in co-operation. For further particulars regarding rates, etc., write

DR. ALBERT E. STERNE or
DR. LARUE D. CARTER

"Norways" Hospital for General Diagnosis and Nervous Diseases.

THE NEW YORK POLYCLINIC

MEDICAL SCHOOL AND HOSPITAL

(ORGANIZED 1881)

(The Pioneer Post-Graduate Medical Institution in America)

EYE, EAR, NOSE and THROAT

FOR INFORMATION ADDRESS

MEDICAL EXECUTIVE OFFICER: 345 West 50th Street, NEW YORK CITY

University of Pennsylvania

Graduate School of Medicine

The Medico-Chirurgical College

Courses for Physicians

Regular graduate medical courses of one, and under certain circumstances of two and three years' duration, leading to appropriate certificates or graduate medical degrees in the following separately organized and conducted clinical and medical science departments: Internal Medicine, Pediatrics, Neuropsychiatry, Dermatology, Syphilology, *Radiology, Surgery, Gynecology-Obstetrics, Orthopedics, Urology, Ophthalmology, Otolaryngology, Proctology, *Biochemistry, *Anatomy, *Physiology, *Pathology, *Bacteriology-Immunology, *Pharmacology.

In every course the registration quota is limited. All of the stated regular courses begin annually in mid-October except in the case of departments designated by the asterisks, wherein the courses begin whenever vacancy exists in the quota. A "year" is thirty-two or more weeks, according to the department concerned. Certain briefer SPECIAL COURSES (special subdepartmental subjects) are also available, as follows: Tuberculosis, Clinical and Sociologic; Cardiology; Parasitology and Tropical Medicine; Gastroenterology; Allergy; Diabetes Mellitus, Arterial Hypertension and Obesity; Electrotherapeutics; Intubation; Basal Metabolism; Clinical Dermatology; Neuroanatomy, Neurophysiology and Neuropathology; Neurootology; Clinical Psychiatry Operative Surgery and Surgical Anatomy; Gynecology for the General Practitioner; Cystoscopy (Women); Orthopedic Diagnosis; Operative Orthopedics; Ophthalmic Operations; Ocular Perimetry; Ocular Musculature; Ocular Refraction; Slit Lamp Microscopy; Ophthalmic Histology, Pathology and Bacteriology; Laryngoscopy, Bronchoscopy and Esophagoscopy; Otologic (Cadaver) Operations; Otolaryngologic (Cadaver) Operations; Correction of Defects of Speech; Clinical Biochemistry.

Address: Dean, Graduate School of Medicine, University of Pennsylvania, Philadelphia

UNIVERSITY OF MARYLAND, SCHOOL OF MEDICINE
AND
COLLEGE OF PHYSICIANS AND SURGEONS

Requirements for Admission—Two years of college work, including English, Chemistry, Biology and Physics, in addition to an approved four years high school course.

Facilities for Teaching—Abundant laboratory space for equipment. Two large general hospitals absolutely controlled by the faculty and several hospitals devoted to specialties, in which clinical teaching is done.

For catalogue apply to J. M. H. Rowland, M.D., Dean, N. E. Cor. Lombard and Greene Sts. Baltimore, Md.

AT THE MENOPAUSE

The distressing symptoms that so frequently accompany the climacteric, but more particularly the aggravated symptoms of the artificial menopause, are often controlled by the administration of

LUTEIN TABLETS, H. W. & D.
LUTEIN SOLUTION AMPULES, H. W. & D.

The choice of the medication depends, of course, on the judgment of the physician as to whether oral or hypodermic administration is indicated. Both products represent the

CORPUS LUTEUM OF THE SOW

unmodified by treatment with solvents or by exposure to temperatures above animal body heat in the drying process. All separation of extraneous matter is made by mechanical means and all drying is *in vacuo*. The unaltered *corpus luteum* should, therefore, be presented in our products and clinical experience with them should demonstrate their therapeutic activity.
Ovarian dysfunction as evidenced in dysmenorrhea and amenorrhea is also an indication for Lutein medication, and if the diagnosis of such dysfunction is reasonably well established, definite therapeutic results may be expected.

WHOLE OVARY TABLETS, H. W. & D.
OVARIAN RESIDUE TABLETS, H. W. & D.

are also offered for those who prefer, for certain indications, the use of the whole gland or of the residue remaining after *corpus luteum* separation.

LITERATURE FURNISHED UPON REQUEST

H. W. & D.—SPECIFY—H. W. & D.—SPECIFY—H. W. & D.—SPECIFY—H. W. & D.

HYNSON, WESTCOTT & DUNNING
BALTIMORE, MD.

RADIUM RENTAL SERVICE

BY

THE PHYSICIANS RADIUM ASSOCIATION

Organized for the purpose of making radium available to Physicinas to be used in the treatment of their patients. Radium loaned to Physicians at moderate rental fees, or patients may be referred to us for treatment if preferred.

Careful consideration will be given inquiries concerning cases in which the use of Radium is indicated.

The Physicians Radium Association

1307 Pittsfield Building
CHICAGO, ILL

Telephones:
Central 2268-2269

Wm. L. Brown, M.D.
Director

BOARD OF ADVISORS

William L. Baum, M.D.
Walter S. Barnes, M.D.
Louis E. Schmidt, M.D.
Bennett R. Parker, M.D.
Frederick Menge, M.D.
S. C. Plummer, M.D.

SOUTHERN MEDICAL JOURNAL

JOURNAL OF THE SOUTHERN MEDICAL ASSOCIATION

PUBLISHED MONTHLY BY THE SOUTHERN MEDICAL ASSOCIATION AT BIRMINGHAM, ALA.

Volume XXIII MAY 1930 No. 5

A GROUP OF PATIENTS SUFFERING FROM PARALYSIS DUE TO DRINKING JAMAICA GINGER*

By C. R. BENNETT, M.D.,†
Meridian, Miss.

Within the past few weeks a rather widespread epidemic of a somewhat unusual type of paralysis attributed to the drinking of Jamaica ginger has been brought to the attention of public health bureaus in several of the Southern states. Mississippi has reported a number of these.

A number of cases have been sent to the East Mississippi State Hospital with the request that they be allowed to take sweat baths and other hydrotherapeutic treatments for the paralysis. This request was granted, and it was agreed that we might study the cases and report on them. So far we have observed ten cases and are submitting a report of these.

Case I.—J. A. B., a man, age 25, said that he drank a small amount of Jamaica ginger nine days before any symptoms appeared. He first noticed a dull aching in the calf muscles of his legs and described the aches as of a shifting nature. The tenderness was not localized in the same spot at different examinations. There was no severe pain. The tenderness was exaggerated somewhat by walking. Although he was, as a rule, a good sleeper, he complained that during the first few nights after the onset of his first symptoms he woke up frequently at night. About three days after the pain occurred in his legs he noticed that they were getting numb and weak and within two days when he walked his foot dropped at the ankle so that it was necessary for him to raise it higher than usual in order to avoid dragging. Three days from that time he felt a numbness in his fingers, but described it as different from the feeling in his legs. The exact difference could not be described. He experienced difficulty in doing anything with his hands which required any strength in his fingers. It was difficult to hang on to heavy objects and he had trouble sometimes even in buttoning his shirt. It seemed as if he had not strength enough to push the button through the button hole. With special effort the act was accomplished. He had no feeling of illness at any time. He does not feel weak, but says that he is not able to make the movements that he used to make. In attempting to stand alone he steps forward and backward in an apparent attempt to stabilize himself and if he remains standing for more than a minute or so the legs begin to crumble and he falls unless he is supported. There is no alteration in the normal sensation. The epicritic sensibilities are unaltered and the patient readily distinguishes between hot and cold. He can detect pain and pressure sense and, in fact, shows no deviation from the normal. The knee kicks are hyperactive in both knees. The Babinski is negative. The Rhomberg cannot be elicited because the patient, on account of muscular weakness, is unable to stand.

Case II.—C. H. B., a man, age 35, states that he, with one other person, drank three bottles of "jake" (Jamaica ginger) sixteen days ago. About five days later he became bilious, his stomach was out of order, he became restless at night and nine days after those symptoms appeared his calf muscles became sore and he found it difficult to use his legs as he formerly had. In three days the maximum degree of paralysis had been reached and he has been practically in the same condition for the past five or six days. He states that he feels as if his feet were dragging and for that reason steps higher than ordinarily. His legs feel numb up to the knee.

He says that two days after drinking the "jake" his eyes became sore and inflamed and felt as though there were pieces of steel in them. His vision was smoky during this time. This condition lasted for three days, gradually disappeared, and he has had no eye symptoms since. Thirteen days after the drinking all his fingers became involved. He could feel everything that he touched, but his fingers seemed to be numb and dead. He complained of weakness in the fingers, but was able to move them without any particular effort. This man has a positive Babinski. The knee kicks are active, the pupils respond to light and there is no alteration in cutaneous sensibilities.

Case III.—T. E. B., a man, age 38, says that he drank one bottle of Jamaica ginger and about six days later had pain across the back in the region of his kidneys. His stomach became upset and he said that it growled loudly. He complained of sore throat at about the same time. The next day his right hip was sore. No other symptoms were noted for four or five days. At that time, however, the soreness extended down his left leg until it had reached his toes. Before that process had been completed the left hip presented similar symptoms and the condition extended down the left leg until the two sides were practically identically involved, except that the right leg was much weaker than the left. During this time he noticed that the

*Received for publication April 1, 1930.

†Assistant Physician, East Mississippi State Hospital.

toes on both feet became swollen and were very tender and red. A definite demarcation could be seen at the time of examination, but the swelling had practically disappeared and the toes were no longer tender. He stated that his urine during this time was very dark red and had a bad odor to it. Eleven days after the onset of the first symptoms in his legs he complained that his hands felt queer. By night of that day he was unable to raise his hands. His left hand was not quite so helpless as his right. The legs, when extended, showed a normal resistance to forced flexion, but when flexed they were easily extended with very little effort. The same condition was present in the arms. A very definite foot drop occurred when the patient was walking, indicating again that the flexor muscles of the feet were weaker than the extensors. There was some past pointing of the right hand in the finger-nose test. The same uncertainty existed in the right foot in attempting to bring his large toe in contact with a fixed object in front of him. Knee kicks were hyperactive. The Babinski was negative. The plantar reflexes were absent.

Case IV.—C. H., a man, age 36, drank one two-ounce bottle of Jamaica ginger three weeks ago. Nine days after drinking it he noticed tenderness in the calf muscles of his legs. They were sore for four days and then the tenderness subsided. He stated that twenty-four hours after the soreness started he began getting weak in the legs. He resorted to hot baths and massages to relieve the aching, but was not relieved. He complained of having cramps in the stomach two days after drinking, but states that he had taken a purgative and thought that the purgative was responsible for the stomach condition. Otherwise he experienced no illness. This patient had been drinking whiskey before and after he drank the last Jamaica ginger. The upper extremities were not involved. The knee kicks were hyperactive. The pupils responded normally to light. Babinski and ankle clonus were negative. There were no plantar reflexes and voluntary movement of the toes was entirely absent except very slight flexion on the large toe of the left foot. There was absolutely no motion in the right toes. There were no sensory disturbances. There is some athetoid movement of the foot when he attempts to point with his toe to some fixed object in front of him. He says that he has no difficulty in raising his feet, but that he has a queer feeling of uncertainty as to where they are going to land, and he usually steps on his heels first.

Case V.—A. H. H., a man, age 27, states that he drank the last "jake" about 14 days before any paralysis was noticed. He drank one ounce. At the same time he had three drinks of ordinary whiskey. He had no discomfort at any time. The first thing that he noticed was that when he arose in the morning his feet dropped and he was unable to walk without lifting his feet high enough to avoid dragging. Both legs were involved at the same time, but the right seemed to be more affected than the left. Three days after the onset of his paralysis the thumbs on both hands became involved to the exclusion of the other fingers. He had one or two short spells of diarrhea several days before the paralysis started. The flexor muscles were involved. The knee kicks were hyperactive. The Babinski was negative and plantar reflexes were not demonstrable. There were no sensory disturbances and no eye symptoms.

Case VI.—T. B. S., a man, age 28, says he drank the last "jake" seven weeks ago and noticed no symptoms until eleven days ago. The only thing that he drank within this time was a little whiskey three weeks before the onset of his paralysis. His father drank some "jake," but was not affected by it. He drank none of the whiskey. Two other men, however, drank some of the whiskey at the same time that the patient drank it and neither one of them has had any symptoms so far. This patient's symptoms started with an aching in his legs. The hands were not affected. He states that he was rather severely ill for about six days before the paralysis started, but that he had been out of bed two or three days before it. During his stay in bed he complained of aching all over, a tired out feeling, and states that he had about one degree of fever. The knee kicks were hyperactive; the Babinski and ankle clonus were negative. The sensory changes were not noticed and there were no eye symptoms. The flexor muscles were chiefly involved.

Case VII.—J. W. R., a man, age 31, drank one ounce of "jake" two weeks before any symptoms occurred. There were no untoward symptoms immediately after drinking it. He did, however, have a chill about four days before the paralysis started and says that he had some fever. With the onset of symptoms his feet began to ache and the discomfort extended up his legs as far as his knees. Tenderness was not severe, but was worse when he was walking. This condition existed for four days, after which the weakness in the lower extremities commenced. There is no numb feeling, but the patient could not stand without aid of a stick to support himself. He states that it seems as though he loses his balance and has to change his position in order to maintain equilibrium. The knee kicks are absent. The pupils react normally to light. The Babinski and ankle clonus are negative. The plantars are negative. There are no eye symptoms. The upper extremities are not involved. The patient is able to move the toes on both feet only very slightly. The cutaneous sensations are normal. The patient states that he had a chancre nine years ago, which may account for the absent knee kicks. The Wassermann has been taken and found negative.

Case VIII.—J. Q. H., a man, age 40, drank "jake" on February 2, this being the last time before the onset of his paralysis March 18. At this time he drank four two-ounce bottles within twelve hours. There was no sickness at the time he drank nor immediately following. He had been drinking whiskey before and after drinking the "jake." Another person drank the same brand of "jake" at the same time, also some of the same whiskey, but has experienced no symptoms of the paralysis. The first symptoms in this patient occurred five weeks after drinking the "jake." The calves of his legs were tender and he noticed no other symptoms for three days. He then noticed that his ankles were getting weak. They were not painful, however, and in fact there was no pain in any other part of the body at any time. There was no swelling nor tenderness of the toes. Six days after paralysis started in his feet he first noticed weakness in all the fingers of the right hand. Twenty-four hours later this same weakness appeared in the fingers of the left hand.

The knee kicks are hyperactive; the Babinski and ankle clonus are negative; the plantar reflex does not function. The cutaneous reflexes are normal. There have been no eye symptoms.

Case IX.—S. H. H., a man, age 35, drank some "jake" on March 15 and drank some other whiskey even after the paralysis started. He noticed the first symptoms three days after drinking the "jake." The

calf muscles were sore. Both legs were affected simultaneously. The soreness persisted four days before the paralysis started. He states that the calf muscles became hard. There were no symptoms in the upper extremities. He was not sick at any time, although he stated that his stomach was a little sore three or four days after drinking. The eyes were not affected.

The knee kicks are hyperactive; the Babinski is negative; the sensory nerves are not affected; and plantar reflexes do not respond to stimulation. The patient exhibits the same high-stepping gait which all the others have shown and is unable to stand without some support.

Case X.—G. R. S., a man, age 34, drank about half an ounce of "jake" on March 13 and drank one bottle of a different brand two weeks before that. On March 13 he drank the "Q-C" brand. He did not know the name of the first brand. He first noticed that the calf muscles were sore three days after drinking the last "jake." One other person drank most of the same bottle at the same time and has had no bad effects. This patient drank liquor and home brew before and after drinking the "jake." He has not complained of being sick at any time. The hands are not affected. The plantar reflexes are abolished. The knee kicks are active, but not exaggerated. The eyes are not involved. The Babinski is negative. There is no alteration in the sensory nerves.

COMMENT

This series of cases shows certain very definite peculiarities which tend to bewilder us in making any diagnosis or prognosis.

The etiology is obscure. It can hardly be doubted that the affliction is a condition associated in some way with the use of intoxicating beverages, since, without exception in this group we have a very definite history of an indulgence in alcoholic beverages over a prolonged period of time. That the paralysis is due to Jamaica ginger, commonly called "jake," is not evident, however. All patients in this series give a history of having taken "jake," but the wide variation in the time relation between the drinking of the "jake" and the onset of the paralytic symptoms is confusing. Two patients state that symptoms started three days after drinking it and one claims an intervening period of 42 days. We can assume that their statements are reliable, since each patient is mentally alert and, in admitting that he had drank the "jake" at all, could have no reason for malingering in regard to the time which elapsed before the onset of symptoms. It might be reasoned that in those cases of short reaction time the patient had taken other specimens previous to the last ones, and that those previous instances were responsible for the trouble. In two or three cases that conclusion might logically be drawn, but in the rest only the one specimen had been used within a period of weeks or months. In all cases, ordinary whiskey (corn) was used rather commonly and frequently, both before and after drinking the accused "jake." If these case histories correspond with other series in this respect, it would seem that suspicion should be strongly centered on samples of bootleg whiskey and those samples analyzed along with the "jake."

Another very disconcerting bit of evidence in this series is the fact that in three instances patients suffering from the paralysis drank at the same time and of the same "jake" which other persons drank who have not suffered any symptoms whatever of the paralysis.

It was also noticed that the younger patients were less completely paralyzed than older ones. In our group three patients, all brothers, were 25, 35 and 38 years, respectively. They drank "jake" at the same time, but the youngest could stand alone for several minutes and could voluntarily move his toes. The 35-year-old patient could stand only for three or four seconds without support and could move only one or two toes. The 38-year-old patient had absolutely no voluntary use of his foot muscles and could not stand at all unsupported. Two other patients, aged 28 and 31 years, presented a light form of the paralysis.

In reading over the case histories the following points were observed:

(1) Sensory nerves were not involved aside from a subjective feeling of numbness.

(2) The paralysis started with the aching in the calf muscles which preceded by three or four days the actual onset of signs of paralysis, and which in about half the cases extended within three days to the upper extremities, involving in some cases only the thumbs, and in others all the fingers.

(3) The only subjective symptoms after the initial aching were loss of strength in the affected parts.

(4) The knee kicks were exaggerated except in two cases. One of these had a normal reaction and in the other the kick was entirely absent. The plantar reflexes were abolished entirely in all cases. The Babinski was positive in one case.

(5) The flexor muscles showed the greater weakness, thus allowing foot drop and the high stepping gait characteristic of all cases.

(6) Symptoms of gastro-intestinal disturbance

were common, but absent in several cases, and were mild when present.

(7) Eve symptoms were noticed in only one case, and in that case they were of short duration.

DIAGNOSIS

It is extremely difficult to make the diagnosis because of the obscure etiology and the absence of uniform symptoms. Paralysis, of course, is the chief objective finding. This paralysis in every case is flaccid in nature. Although one patient complained that his calf muscles became hard, examination showed that the usual flaccid condition existed, and we assume that he had examined his muscles standing, when they were under tension.

We must assume, first, that the paralysis is due to an involvement of the lower motor neuron, as paralysis caused by an upper motor neuron is spastic in character.

The common forms of paralysis of a flaccid nature are Landry's ascending paralysis, myotonia congenita, tumor of the spinal cord, multiple neuritis, hemorrhage affecting certain segments of the spinal cord, lead palsy, acute anterior poliomyelitis and spinal or neuritic muscular atrophy.

Myotonia congenita occurs only in infants. Tumor pressing on the spinal cord produces marked sensory symptoms and incontinence of urine is practically always present. In cases of hemorrhage in the spinal cord, the paralysis is confined to the distribution of one or two spinal nerves. Lead palsy implies a history of chronic exposure to lead, or a heavy single toxic dose resulting in severe gastro-intestinal disturbances. The four remaining types of paralysis which must be differentiated are multiple neuritis, anterior poliomyelitis, Landry's paralysis and the peroneal type of neuritic muscular atrophy.

The last named is a disease chiefly confined to childhood or to young adulthood, is characterized by slow onset and is usually familial in its etiology.

Multiple neuritis often follows a history of excessive use of alcohol and is characterized by a paralysis in the form of a paraplegia, a flaccid paralysis of the muscles of the lower extremity causing foot drop and the high stepping gait, and presents many variations in the distribution and extent of sensory and motor involvement. Nearly every patient with multiple neuritis complains of severe pain over all the affected area, so intense that even the clothing causes an unbearable irritation. Multiple neuritis does not follow the ingestion of small amounts of alcohol, but rather is the result of a long-continued debauch. While some of these "jake" patients are habitual drinkers, there are many cases which indulge only moderately and in no case, in this small series, was there a history of a long-continued drunken spell. In no case was there a history of the excruciating pain typical of neuritis.

Anterior poliomyelitis is epidemic in nature, most common among children, is usually accompanied by rather severe systemic symptoms and often involves only part of the leg muscles. The present "epidemic," if it may be so called, has not shown any severe systemic reactions, has affected adults only, with but few exceptions, and does not appear to be contagious.

Landry's paralysis is characterized by a paralysis starting in the feet and rapidly ascending the legs, at the same time involving the upper extremities shortly after onset of paralysis in the lower extremities. The disease usually affects adult males and, according to White and Jelliffe, is due to a condition of acute intoxication. The prodromata usually are paresthesiae of the limbs, pain in the back and stiffness of the neck. There is some general malaise, but fever is usually absent. Paralysis of the legs soon follows, flaccid in character, sometimes with loss of knee kicks. Sensation is not affected. In typical cases, the paralysis extends upward, involving the trunk, segment by segment, until all the thoracic muscles are involved, thus producing paralysis of the respiratory movements and subsequent death.

It seems that our group of cases would correspond most closely to the Landry's type of paralysis. The prodromal symptoms are similar, the areas involved correspond, except that in our group of cases, the paralysis has not involved the

thoracic segments, and no deaths have resulted. In the Charcot-Marie-Tooth's type of muscular atrophy, the paralysis corresponds more typically to this group of cases, in that the paralysis affects both the legs and hands, but seldom affects the muscles above the knees. This affection, however, is very seldom found in persons over 20 years of age, a fact which does not fit in with this group of patients. The progress of this disease is much more chronic in its development than in our group of patients.

PROGNOSIS

It has been reported that several of these cases have died, but no authentic reports of autopsy findings are yet available. There seems to be very little improvement in any of the cases observed here. The only treatment being given this group is a steam sweat bath for 15 minutes once a day, followed by a warm shower, Scotch douche and finished by a cold shower. The patients feel much better after each bath, but no improvement is seen in regard to the paralysis and some cases have even become worse under treatment.

SUMMARY

(1) The present epidemic of paralysis is undoubtedly related in some way to the use of intoxicating alcoholic beverages.

(2) That Jamaica ginger ("jake") alone is responsible is not an established fact, since some persons who drank specimens of "jake" were severely stricken while others who drank the same specimen at the same time were not affected.

(3) Of the known types of flaccid paralysis this group corresponds more nearly to that of Landry's ascending paralysis, although the severe terminal symptoms characterizing that condition have not yet developed.

(4) The prognosis is guarded. No appreciable improvement has been seen in any of our cases.

A gradually increasing number of these patients are coming under our observation and are being watched closely for important developments. This preliminary report will be followed by a second report if subsequent developments warrant it.

JAMAICA GINGER PARALYSIS*
(A PERIPHERAL POLYNEURITIS)

By SEALE HARRIS, JR., M.D.,
Birmingham, Ala.

Newspapers have recently published reports of a large number of persons who were affected with a form of paralysis said to be caused by drinking Jamaica ginger. The majority of these cases have been more or less localized in sections of Oklahoma, Tennessee, Kentucky, Alabama, Mississippi and other Southern states. The exact nature of the causative factors of this malady is still obscure, although the clinical picture seems to be definitely that of a multiple peripheral neuritis. Jamaica ginger has long been used as a carminative and at times as a diaphoretic. Its use as a beverage, although not common, is not new. Many of the patients now affected with so-called Jamaica ginger paralysis have been drinking it for several years, especially since hard liquors have been difficult to obtain in this country. The alcoholic content, which is usually from 60 to 90 per cent, is, of course, its attraction to those who use it as a beverage. It has been quite accessible, being sold in small bottles by many druggists. The common way in which it is made palatable is by dilution in fairly large amounts of water or soft drinks. Those who drink it do not usually imbibe daily, but seem to take it only on occasions, and then do not go on prolonged debauches. This is in decided contrast to the circumstances which usually precede a typical case of alcoholic neuritis. The fact that this paralysis is a multiple peripheral neuritis, however, is well borne out by the clinical findings in these patients.

One of the outbreaks of this form of paralysis occurred in a small isolated town in southern Alabama. The town has a population of about 100 and is situated 25 miles from the nearest railroad or bus line. The occupation of the majority of the people in this community is farming and they seldom leave the vicinity and relatively few people visit the town. The local physician referred one of the patients to the Seale Harris Clinic and invited the writer to visit the town in order to see the remainder of the patients affected with the disease. It seemed that though the actual number of patients in the series was small, the isolation of the community,

*Received for publication April 15, 1930.

the clear-cut nature of the etiological factors and the frankness of the people would justify a report of the outbreak.

CLINICAL PICTURE

All of these patients were males who had been drinking Jamaica ginger as a beverage, some for many months. A certain number of them reported that they had respiratory infections preceding the onset of the symptoms. The first symptom complained of was soreness in the calves of both legs lasting for one or two days. This soreness disappeared at the same time that they noticed that it was difficult to control the movements of the feet. This difficulty rapidly progressed until they were unable to get about without the use of crutches or canes after about a week. At this time some of them began to complain of weakness of the hands and forearms. This was not usually preceded by any soreness. The patients also noted that the skin over the feet was glossy and tight, but did not feel that there was any noticeable swelling. They did not complain of any pain, hyperesthesia or ataxia. The distribution of the weakness was practically uniformly bilateral. One patient on three occasions complained of inability to pass his urine and required catheterization once. As the weakness progressed some of them became bed-ridden, but the majority of them continued to get about with the aid of crutches and canes. There were no mental nor definite gastro-intestinal complaints.

The neurological examination of these patients showed no cranial nerve changes. The optic discs were normal in appearance. Steppage gait and foot drop were constant in all of the patients. Those in which the upper extremities were involved showed a bilateral wrist drop. There were no constant sensory changes, although there was definite but moderate hyperesthesia of the soles of the feet in two patients. The skin over the dorsum of the feet was usually slightly reddened and glossy, giving the appearance of very slight edema. The paralysis was chiefly limited to the muscles of the lower legs, although in some the thigh muscles were also involved. In the cases in which the upper extremities were involved, the forearm muscles and the intrinsic muscles of the hands were affected. Beginning atrophy of some of the affected muscles was discernible in the two bed-ridden patients. They also showed early contractions of the calf muscles.

The deep reflexes were most inconstant in this series of patients. The ankle jerks were not elicited in any case. In some cases the knee jerks were absent entirely; in others the response was distinctly hyperactive and in some they were within normal limits. The biceps and triceps jerks varied in a like manner. The plantar responses were normal.

None of the patients showed any ataxia or loss of muscle and joint sense of position.

Laboratory facilities were lacking in the community, so practically no reports are available in this respect. In the one patient who was studied in the hospital, nothing remarkable was brought out. His cerebrospinal fluid showed no globulin, but did contain 10 lymphocytes per cubic millimeter. This is a border line count and, in the absence of precipitable protein, is best disregarded.

CASE REPORTS

Case I.—F. B., a rural mail carrier, age 38, on March 7, 1930, noticed that the calves of both legs were sore. One or two days later he noticed that when he walked he "flopped about like a goose." About the same time he noticed that his hands were weak and that he had to use pliers to turn the key to his automobile. The pain in his legs lasted about three to four days and was not severe, but the weakness increased. His wife said that he staggered as if he were drunk. About a week after the onset his feet and hands were so uncontrollable that he could not get about. Just about the time his trouble began he began to have severe night sweats. He has also noticed that he felt weak in the lumbar region. On three occasions since the onset he has had difficulty in passing urine. Once he had to be catheterized. Just a few days before the onset he had a bad head cold and also a slight cold in his chest. He has been taking an occasional drink of Jamaica ginger (three to four per month) since prohibition was passed. Three weeks before the onset he drank 6 ounces. About two weeks before this he had taken several drinks of this ginger over a period of about a week.

Neurological Examination.—The patient was completely incapacitated because of weakness of the upper and lower extremities. He had bilateral wrist and foot drop. The knee, ankle and biceps jerks were not obtained. The left triceps jerk was feeble. There was no ataxia. There was no sensory disturbance. Plantar responses were normal. The spinal fluid was not under increased pressure. The cell count was 10. There was no globulin. Blood and spinal fluid Wassermann reactions were negative.

Case II.—W. E. K., a merchant, age 39, had used about 4 ounces of Jamaica ginger daily for three or four years. He had had no Jamaica ginger for ten days prior to the onset of symptoms. He had a bad cold and sore throat a week before the onset. Six weeks ago, the calves of the legs began to get sore. Two weeks later he went to sleep in a car in a cramped position and found that he could not use his legs properly. There was a soreness of the left calves

before the weakness came on. For the next two weeks he was able to get about all right, but he gradually lost the use of his feet so that now he has to use crutches. There was no hyper- nor hypo-esthesia. There were no bladder symptoms. For the past two days he had had some soreness and dead feeling in the right arm.

Neurological Examination.—The right lense was opaque from an old injury. The cranial nerves were intact. The left fundus was negative. Grips of both hands were weak. There was tenderness over the nerve trunks of both the upper and lower extremities. The tendon jerks were all present, but sluggish except for the right knee kick, which was normal. There was no plantar response, no hyper- nor hypo-esthesia, and no loss of muscle nor joint sense of position. There was bilateral wrist and foot drop. The skin over the feet was glossy and reddened.

Case III.—W. M. McI., a farmer, age 45, had not been drinking for four or five years, but went on a "gentle spree" for four or five days and drank about twenty-five 2-ounce bottles two months ago (last of February). (He was sick with a cold before he drank it.) Two or three days later he had high fever and severe cramping in the legs. He stayed in bed and felt better. He got out two weeks after he went to bed, but on that day found that the calves of both legs were sore. The next morning when he got out of bed he was unable to stand up well. He was able to get about with difficulty for eight days, but gradually got worse until he has to use crutches. He has had some dead feeling in the ankles, but no hypoesthesia and no bladder symptoms. Two weeks after his first motor symptoms, his hands began to get weak. He had no soreness in the arms. The upper extremities were not so severely affected as the lower.

Neurological Examination.—The cranial nerves were intact, the fundi were negative. All deep reflexes of the upper extremities were active. The lower extremities were hyperactive definitely. Weakness of the upper extremities was not so severe as the lower. There was no sensory disturbance. Tenderness over the nerve trunks was quite definite. There was no ataxia. There was slight wrist and definite foot drop. The skin over the feet was red and glossy. Plantar responses were normal.

Case IV.—J. L. McC., a mechanic, age 25, had been using Jamaica ginger four or five years. His average was 8 to 10 ounces daily. The onset of his symptoms was four weeks ago. Two weeks before this he had a very bad cold, but no sore throat. He first noticed that the calves of his legs were getting sore. Three or four days later he noticed that his legs were getting limber. About a week later his hands and arms were affected. The arm muscles did not get sore. There were no bladder symptoms. His toes felt somewhat numb, but he had no diminution of sensation.

Neurological Examination.—The cranial nerves were intact. All tendon jerks were markedly hyperactive. Weakness of the upper extremities was not as marked as that of the lower. There was no ataxia. There was no sensory change. There was definite tenderness of the nerve trunks, especially of the lower extremities. There was no plantar response.

Case V.—J. L. S., Jr., a farmer, age 38, had used Jamaica ginger four or five years, eight ounces a week. He had a bad cold and sore throat a week before the onset of the symptoms, and also diarrhea at the same time. He had not taken Jamaica ginger for ten days. The onset was three and a half weeks ago. He first noticed soreness in the calves of both legs. Two or three days later the soreness left the calves of the legs and he noticed that his legs were getting limber. For about two weeks he was able to get about, but gradually he got worse, so that he was not able to get about without assistance. At the same time that he noticed his legs were weak he noticed that his arms and hands were getting weak. The loss in the use of his hands was not so bad as in his feet. There were no bladder symptoms and no paresthesia nor hypoesthesia.

Neurological Examination.—The cranial nerves were intact and the fundi negative. All tendon jerks were slightly hyperactive. There was marked weakness of both the upper and lower extremities. There was no sensory disturbance and no ataxia. There was marked tenderness over the nerve trunks. There was bilateral wrist and toe drop. The skin over the feet was glossy and reddened.

Case VI.—G. R., a barber, age 34, used very little Jamaica ginger, two or three bottles this year. He had two just after Christmas and one about a week before the onset of the symptoms. He had had a cough, cold and fever for about a week two weeks before the onset. Four weeks ago he had soreness in the calves of the legs and four days later he began to notice that his legs flopped when he walked. About this time he had soreness in the muscles of the forearms. Within a few days his arms were weak, too. About a week after the onset he was unable to get about and has been in bed since. In the past week he has had sharp pains in the legs, knees and arms at times, especially if he lies in the same position for a long time.

Neurological Examination.—The patient was totally incapacitated. There was marked bilateral wrist and foot drop. The cranial nerves were intact. All deep reflexes were markedly hyperactive. There was interosseous atrophy of the hands. There were beginning contractures of the muscles of flexion of the hands. There was no ataxia and no sensory disturbance. There was marked tenderness over the nerve trunks and beginning contraction of the calf muscles. There were normal plantar responses.

Case VII.—R. W., age 42, had drunk twelve bottles (2-ounce) of Jamaica ginger in a little over a week. His symptoms were of three weeks' duration, the onset with soreness in the calves of the legs. Weakness came on about four days later. Four days later he found that he could not walk. At about the same time he began to have weakness of both hands, the right being more severely affected than the left. There were no bladder symptoms. He sat in a cold wind on Monday and caught cold. He found marked orthopnea and edema of the feet that night. His physician found rales over both lungs. His blood pressure was 148/92. His pulse was regular and full. He had been taking digitalis, ten drops every four hours, for three days.

Neurological Examination.—The cranial nerves were intact and the fundi negative. Deep reflexes of the upper extremities were present, the right more active than the left. The knee kicks were very sluggish (obtained only by reinforcement). There was no plantar response. There was moderate hyperesthesia over both plantar surfaces. There was no loss of muscle nor joint

position. There was slight questionable tenderness over the nerve trunk of the legs. There were normal plantar responses. The heart was slightly enlarged with normal rate and rhythm. The sounds were clear.

COMMENT

The chief unorthodox finding in the neurological examination of these patients is the inconstancy of the knee, biceps and triceps jerks. In the usual peripheral neuritis of the motor type, these reflexes are entirely absent. Their presence and hyperactivity in some of these patients seems to indicate that there is not complete nerve destruction extending high up the nerve trunks in all cases. In all cases the ankle jerks were missing, showing that the extreme peripheral damage is constant. The fact that no case gave a Babinski response to plantar stimulation excludes pyramidal tract involvement.

ETIOLOGY

The majority of these patients are between the ages of twenty and forty. An overwhelming portion of those reported are men; very few women have been attacked. This is probably because of the fact that few women have been using Jamaica ginger as a beverage. Only an occasional case has been reported in children. Most of the patients have been of the white race.

A number of the patients give a history of an acute upper respiratory infection preceding the symptoms of neuritis. In fact, some of them have given this as an excuse for drinking Jamaica ginger. The cases, however, have occurred during the season in which colds, sore throats and influenza are most likely to occur. The outbreaks of the disease have not occurred in the usual geographic distribution of epidemics. The town in which these cases occurred is 25 miles from a railroad and there is very little commercial or social intercourse between this vicinity and other more thickly settled communities. Another argument against the infectious origin of this form of neuritis is the fact that, in this community, there has been only one family in which more than one member has been attacked. In this instance, two brothers were attacked and both of them gave a definite history of partaking of Jamaica ginger in fairly large quantities. In spite of the fact that practically all of these men have occupied the same bed and room with their wives and children, none of these other members of their families, except the two brothers mentioned above, has been involved. There were no women nor children affected by the disease in this town. All of these facts make it reasonably certain that this form of polyneuritis is not of infectious origin.

The evidence that this syndrome is caused by some ingredient of the Jamaica ginger that these people have been drinking is practically conclusive. It also seems fairly certain that the outbreak of so many cases almost simultaneously must be caused by some recent change in the ingredients of the Jamaica ginger.

At this time there has not been any report that the offending ingredient of the preparation has been discovered. Many suggestions as to the exact nature of it have been made, but nothing has been proven. One newspaper story says that Cannabis indica is the cause of the outbreak. This, however, seems hardly possible either from the pharmacologic or the economic standpoint. Another article in the press states that there is a plant growing in the West Indies called "derringada," which, when eaten by cattle, causes the same type of symptoms. This article implied that there may have been some confusion between this and the ginger plant by the gatherers of the crude product. This explanation would be quite plausible if there is such a plant which resembles the ginger plant. A careful search of the horticultural department of the Birmingham Public Library, however, does not reveal that the various horticultural encyclopediae and text-books are acquainted with a plant by that name. The plant may be very rare and known only to a few people in a small locality, however. A great deal of investigation of the various brands of Jamaica ginger is being made. It is to be expected that in a short time the problem will be explained. To the writer it seems that the most probable cause of this type of polyneuritis is one or more of the higher alcohols. There is no reason to suspect that methyl alcohol is the offender and the type of neuritis, although similar in some respects, is not typical of that usually caused by ethyl alcohol.

TREATMENT

The rational treatment of all forms of neuritis is that which should be followed in this condition. Since the exact etiology of this condition is not known, there is no specific treatment for it. Needless to say, the patients have already given up Jamaica ginger of their own accord. It is surprising, however, to find that some of the patients are continuing the use

of alcohol in the form of corn whiskey. One of the patients whose history is quoted above is convinced that corn whiskey is the specific treatment for his condition. Although this condition is not typical of the alcoholic neuritis ordinarily seen, it goes without saying that alcohol in any form is strongly contraindicated. The other neurophylic toxins, such as nicotine, arsenicals, caffein and so forth should also be strictly avoided.

Complete rest is one of the most important procedures for patients affected with any form of polyneuritis and should be insisted upon in this form of the disease. These patients are prone to attempt to carry on as long as it is possible, and it has been difficult, except in the bedridden cases, to secure cooperation in this respect. They should at least be compelled to rest the extremities that are involved in the disease. One of the patients in this series found, after the onset, that he could flex his feet and would constantly tap the floor with his toes. This was not the wise thing for him to do. Complete rest in the first or acute stage of this condition is imperative.

After this stage has passed off, massage and passive motion should be instituted. This should be a gradual process, but should be increased slightly each day. When, and if, the power of movement begins to return, the patient should begin active motion. Care should be taken, however, that he does not allow the parts to become greatly fatigued. Naturally these patients are quite anxious to improve rapidly and they are quite apt to cause a temporary setback by overdoing the active movements. The massage and passive movements will to a great extent ward off atrophy of the muscles involved in the distribution of the affected nerves.

In any form of paralysis incapacitating contractures of muscles are apt to occur, and in this series this complication is quite evident. The prevention of contractures should be one of the first precautionary measures to be undertaken, as once they have formed they are very difficult to overcome. From the earliest stages, the bed clothes should be cradled above the feet so that the tendency toward foot drop may not be enhanced by the added weight of the cover on the feet. Sand bags, covered bricks or boards should be placed beneath the balls of the feet in such a way as to bring the plane of the feet at right angle to the plane of the lower legs. Since the muscles of the upper extremities are not usually involved to so great an extent as the lower, contractures are not so likely to develop in them. However, placing a rubber ball, such as a tennis ball, in the hands for several periods during the day, will tend to ward off a possible contracture of the flexor muscles of the fingers. Active and passive movement and massage, after the acute stage, will also increase the nutrition of the muscles and will increase their extensibility.

After the chronic stage has begun, galvanic stimulation of the nerve trunks involved will be of benefit. This current should be used with discretion, however, and the voltage and the length of time of the periods of treatment should be regulated so that the patient does not suffer pain or fatigue. Faradic current over the muscle groups supplied by the affected nerves should also be of benefit.

The dietary treatment of these patients is of importance. Since none of this series, nor of any of the cases reported in the meager newspaper descriptions, nor any of which the author has heard, has had any gastro-intestinal symptoms, there is no reason why they should not have a full diet. The foods which are rich in vitamin B should be partaken of freely, as this antineuritic vitamin will be of assistance in the regeneration of the damaged nerve tissue. The husks of grain in the whole wheat breads and cereals and fresh citrus fruits abound in this important food factor. Leafy green vegetables and other fresh fruits contain this vitamin. Unbolted or water-ground corn meal is said to contain more of vitamin B than does the ordinary meal.

The general rational treatment of any chronic disease will stand well in this condition. Constipation should be controlled by such measures as are necessary, avoiding, of course, the weakening effects of strenuous purgation. In the rare case that presents bladder symptoms, catheterization should be avoided as long as possible. The retention in the one patient of this series was not serious enough to require withdrawal of the urine except on one occasion.

After the acute stage has passed, strychnine in moderately small doses may be of benefit.

PROGNOSIS

None of these patients has been followed for a sufficient length of time to venture a prognosis. However, since the disease seems to be peripheral polyneuritis, the outlook should be favorable for the patients who are treated conservatively and in whom contractures are prevented. The period of convalescence will probably vary from three months to a year or more, depending on the amount of nerve damage that must be overcome by regeneration. There is no reason to expect any deaths except from secondary causes.

DISCUSSION

Probably the most common form of multiple peripheral neuritis is that which is caused by ethyl alcohol. The typical symptoms of alcoholic neuritis are characterized by both motor and sensory symptoms, with the latter predominating. The first complaint is usually hyperesthesia and paresthesia, weakness and a varying degree of edema of the parts affected develops later. These patients also complain of tenderness along the courses of the peripheral nerve trunks. Alcoholic neuritis is considered to be more common in women than in men. Not infrequently mental confusion or even a well developed alcoholic psychosis is present, particularly at the onset of symptoms.

In the past few years there have been many cases of poisoning by methyl alcohol. This type of alcohol, however, has a very decided affinity for the optic nerves, and for this reason alone need not be considered as being the etiological factor in the Jamaica ginger type of polyneuritis.

In 1900, a large number of cases of polyneuritis were reported among the beer drinkers of England. This outbreak was traced to the fact that the sugar which was used in the manufacture of the beer contained a certain amount of arsenic. Arsenical neuritis, like alcoholic neuritis, is characterized by a great deal of pain, hyperesthesia and paresthesia. These sensory symptoms are even more marked in the arsenical type than in the alcoholic. Arsenical dermatitis also frequently accompanies the neuritis of this type. In fact, dermatitis is a much more frequent manifestation of arsenical poisoning in anti-syphilitic therapy than is neuritis.

Another type of polyneuritis, which is not uncommon, is that due to lead poisoning. In this type of neuritis the motor symptoms predominate and the patients do not usually have any marked degree of sensory complaints. Lead poisoning, however, is practically always accompanied by marked gastrointestinal symptoms, a lead line about the teeth and by stippling of the red blood cells.

There are several other types of multiple neuritis which are seen in varying degrees of frequency. Other metals, such as mercury and copper, have been known to cause neuritis rarely. Diabetes, beri-beri and diphtheria are commonly complicated by multiple neuritis. Infectious neuritis occurs, but rarely is distributed symmetrically. Acute pernicious multiple neuritis (Heive-Medin disease) is a rare type of interstitial and hemorrhagic neuritis which is usually rapidly fatal.

None of these most frequent types of neuritis seem to fit the syndrome that is under discussion. This fact is borne out by the discussion of these cases. An atypical form of poliomyelitis as the explanation of this new affection does not seem likely because of the geographical distribution of cases, the usual lack of fever, the symmetry of the paralysis, the lack of pain, the age of the patients, and lack of spinal cord symptoms with no changes in the cerebrospinal fluid in these cases.

CONCLUSIONS

(1) All of the cases in this series point to a peripheral polyneuritis.

(2) All of these patients gave a history of having drunk Jamaica ginger.

(3) The condition does not seem to be of infectious origin.

The author wishes to express his appreciation to Dr. R. E. L. Smothers, of Coffeeville, Alabama, for his valuable assistance in assembling the clinical material for this case study.

2234 Highland Avenue.

THE NATURE AND TREATMENT OF CARDIAC FATIGUE*

By TINSLEY RANDOLPH HARRISON, M.D.,
J. ALFRED CALHOUN, M.D.,
and
COBB PILCHER, M.D.,
Nashville, Tenn.

INTRODUCTION

More than a hundred years ago Corvisart[1] wrote his book on heart disease and thereby laid the foundation of modern clinical cardiology. Since then many additions to this science have been made. Heberden,[2] who described angina pectoris; Withering,[3] who taught physicians to use digitalis; Laennec,[4] who introduced the stethoscope, and Louis,[5] Hope,[6] Corrigan,[7] Skoda,[8] and Flint,[9] who perfected auscultation; Bright,[10] who differentiated renal from cardiac dropsy, Stokes,[11] Mackenzie,[12] Wenckeback,[13] and Lewis,[14] who studied cardiac arrhythmia; these are but a few of the distinguished names on a roster of which we should be proud. To Sir James Mackenzie more than to any other belongs the credit for focusing the eyes of the clinician on the fundamental question: "What is this patient's heart able to do?" It was he who taught that symptoms are more important than signs, for they are the best guide to whether the cardiac muscle is able to meet the load which it must overcome in order that circulation be efficiently maintained. As the clinician is often confronted at the autopsy table with a hypertrophic heart muscle showing few signs of disease, Mackenzie believed that in such cases failure of the heart muscle could be explained only by the assumption that it was exhausted or "fatigued."

Since its introduction, the term "cardiac fatigue" has been rather widely used. Its very vagueness has perhaps sometimes been a source of comfort to clinical teachers, when students have asked embarrassing questions as to the reason for the failure of a healthy looking heart. It is well for us to recognize that a name does not constitute an explanation.

There are several well known causes of heart muscle failure. They may be conveniently divided into the pathological, physiological and anatomical factors.

(1) *Pathological Causes.*—The studies of Rhode[15] and those of Vischer and Starling[16] have shown that injury to the myocardium causes dilatation. When this principle is applied to clinical medicine it is readily seen why extensive disease of the heart muscle causes heart failure. Occasionally one sees at the postmortem table the most extreme myocardial fibrosis or inflammation; but this is exceptional. In the majority of instances the degree of pathological change is not adequate to explain heart failure. As Christian has said:

> "At autopsy we usually find a heart with thick muscle walls. Very often this muscle is normal in appearance, consistence and color. With occasional exceptions, there is nothing to suggest degenerative changes in the muscle cells, no evidence of connective tissue increase, no signs of a defective nutritive supply of blood. There is no deformity of the valves, no thickening of the pericardium, no abnormal deposits of fat. Often the coronary arteries appear entirely normal; sometimes they show small plaques of sclerosis which seem incapable of causing any disturbance in this function; more rarely they show narrowing of lumen and marked thickening of the wall. In the majority of these hearts microscopic study reveals no more. Looking at the heart one would surmise it to be a powerful muscular organ capable of more than a normal amount of sustained work. Actually it has failed to do its work. . . ."[17]

(2) *Physiological Causes: Overwork of the Heart.*—Starling[18] and his co-workers have shown that dilatation is the normal response to increased work. In the experimental animal any rise in the aortic pressure or in the venous inflow is immediately followed by dilatation. The vast majority of patients who develop congestive heart failure suffer from diseases which cause an excessive burden to be thrown on the heart. It cannot be doubted that increased work is an important, in our minds the most important, cause of the initial break in compensation. However, there is one feature of congestive heart failure which this hypothesis does not explain, namely, the progressive nature of the malady. In many cases the load on the heart after increasing for a time becomes more or less stationary or may even diminish and yet the patient continues to have "breaks" with increasing frequency. It is a little difficult to explain such cases unless one is willing to assume increasing fatigue with stationary or diminishing work.

(3) *Anatomical Causes: Deficient Blood Supply to the Myocardial Cells.*—It has been shown by Takeuchi[19] that lack of sufficient oxygen

*Clinic, General Clinical Session, Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

*From the Department of Medicine of the Vanderbilt University Medical School.

causes the heart to dilate. Several years ago, before this Association, Dr. Henry Christian read a paper in which he advanced the interesting hypothesis that the capillaries of the hypertrophied myocardium might fail to undergo sufficient increase in number and in caliber to furnish an adequate blood supply. Studies along this line have been made by Wearn,[18] but there is not yet evidence to indicate that the diminution in blood supply occurs frequently enough, or is of sufficient degree to cause cardiac fatigue, although it would seem likely that such a process is important in certain cases. Against the view that the capillaries are insufficient in all hypertrophied hearts is our knowledge that, judging from their ability to perform work, hypertrophic skeletal muscles do not seem to suffer from lack of blood. Furthermore, microscopic study often reveals no evidence of nutritional lack in hypertrophied muscle cells.

As a result of this brief summary it may be stated that the recognized causes of heart failure are not sufficient to explain the clinical phenomena. Overwork of the heart, although undoubtedly very important, does not seem to account for the progressive nature of the malady. Deficiency of blood supply to the myocardium has not yet been adequately demonstrated in a series of cases and seems to be unlikely in many instances. Disease of the myocardium is sometimes sufficient to explain its failure, but such cases are exceptional and in those patients who die of congestive failure without extensive myocardial disease we are forced to assume that the heart muscle has failed because of "fatigue."

It is our purpose in this paper to offer what seems to be a rational explanation of cardiac "fatigue" and in so doing to add another, a biochemical, factor to the causes of heart failure which have been mentioned.

EXPERIMENTAL DATA

As a result of some observations (which were carried out) on patients with congestive heart failure during exercise it was found[20] that the buffering power, that is, the ability to withstand addition of acid, of the skeletal muscles was decreased. The evidence for this was quite strong and apparently conclusive, but was indirect. We, therefore, decided to analyze the muscles of patients dying of congestive heart failure. The alkaline elements in muscle consist chiefly of potassium and sodium, the former being more abundant. In the left half of *Chart I* are shown the results of the analysis of skeletal muscles of patients dying of congestive heart failure as compared with individuals dying of other diseases. It can be seen that the amount of potassium is very much diminished in the former group.

Such a change having been demonstrated in skeletal muscle, cardiac muscle was analyzed. The results are shown in the right half of *Chart I*. The potassium content of the cardiac tissues from subjects dying of congestive failure is likewise decreased.

As is shown in *Chart II*, the potassium contents of the dried skeletal and cardiac muscles are also diminished. Therefore, the lack of potassium in the wet muscle is not simply a dilution effect.

For a number of reasons we have believed that edema was not the effect, but the cause of the

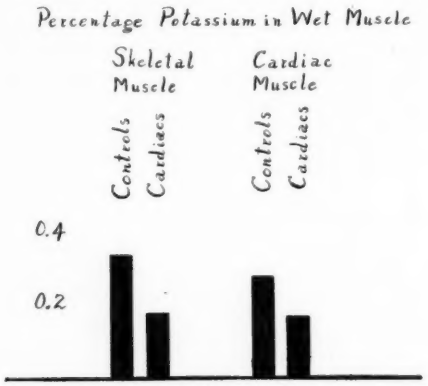


CHART I

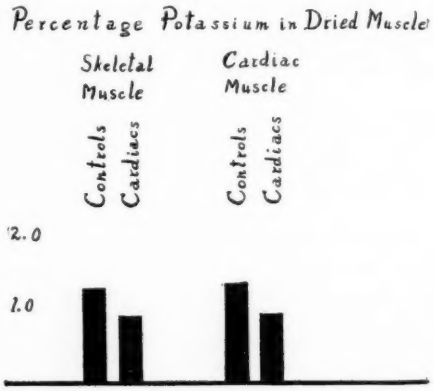


CHART II

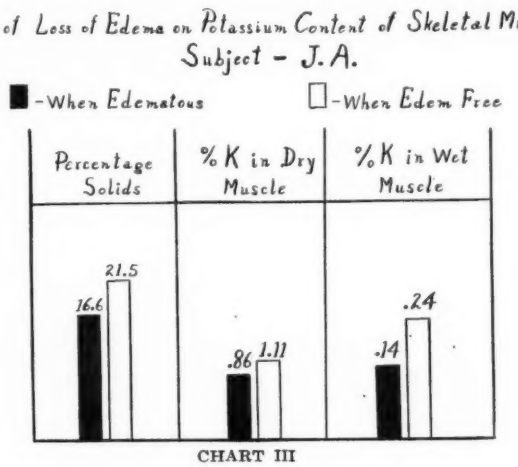


CHART III

loss of potassium. In *Charts III* and *IV* are shown analyses of the skeletal muscle of living patients before and after they have lost large amounts of edema. As edema decreased, the amount of potassium in the muscle increased. The low potassium content of the edematous muscle was not a simple dilution effect because the dried edematous muscle was also low in potassium.

Further evidence that this phenomenon is dependent on edema *per se* is demonstrated in *Chart V*, in which the potassium content is shown to be low in edematous muscles when taken from patients whose edema was not of cardiac origin. It appears, therefore, that edema, by some as yet unknown process, causes diminution in the potassium content of skeletal muscle. Although we have not been able to demonstrate this fact for cardiac muscle, it has been shown (*Chart I*) that the potassium content is diminished, and it seems likely that here again edema is responsible.

It is possible that the other alkaline elements of heart muscle are also diminished, but of this we are not certain. Studies along this line are in progress.

To return to our original thesis, what relation, if any, has loss of potassium and consequent diminution in alkaline reserve in the heart muscle to cardiac fatigue?

In regard to skeletal muscle A. V. Hill and Lupton[21] stated that the ability to withstand fatigue was dependent on the efficiency of the muscle buffers. The difference between the trained athlete and the man of sedentary habits appears to lie, in so far as skeletal muscle is concerned, in the greater buffeting power of the former. That the same is true of cardiac muscle is strongly suggested by the work of Gremels and Starling,[22] who found that acidosis, produced by breathing air enriched with carbon dioxid, caused dilatation of the heart. Eppinger, Kisch and Schwarz[23] confirmed this finding and also observed cardiac dilatation after injecting acids into the blood stream. More specifically Neuschlosz[24] observed that "decreased cardiac tonus" was accompanied by diminution of the potassium content of the heart muscle. Starling[25] and his co-observers have shown that fatigue of the heart is always accompanied by dilatation.

It, therefore, seems justifiable to conclude that loss of potassium from the heart muscle and

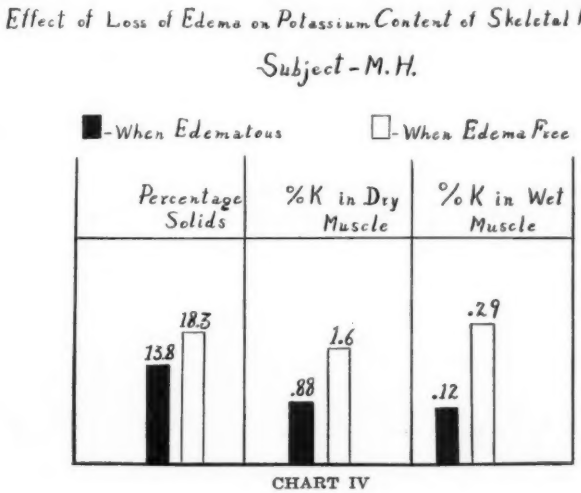


CHART IV

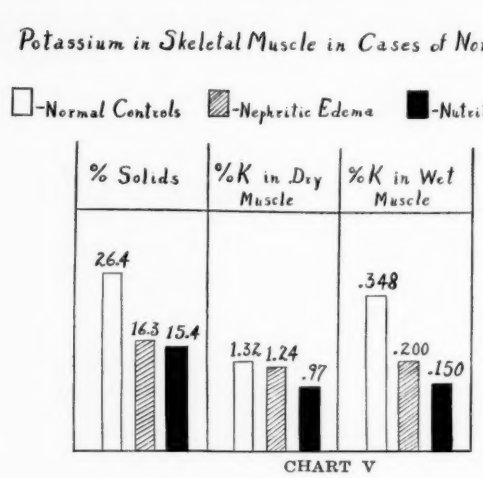


CHART V

consequent deficiency of buffering power may be an important factor in the production of cardiac fatigue. As has been stated, this phenomenon appears to be a result of edema. If this be true, cardiac fatigue is originally a result of cardiac insufficiency. But we believe the fatigue to be also an important cause of further failure, and it is felt that this vicious cycle may explain the progressive nature of the cardiac failure. Congestive failure originally occurs as the result of cardiac overwork or of myocardial disease or of both. Once edema has developed, the heart muscle begins to lose its alkali and with each successive "break" becomes more depleted. The heart has now become fatigued in the true biochemical sense and even though the load may diminish, as is often the case, the vicious cycle continues.

ATTEMPTS AT THERAPY

If cardiac fatigue be due to loss of buffering power, particularly of potassium, is it possible to alleviate the condition in some measure by the administration of potassium salts? This question naturally arises. A definite answer is not yet forthcoming. The results in some patients have seemed encouraging, but we, ourselves, are not yet convinced as to the value of this form of treatment. The following cases are reported, but no definite conclusions are drawn.

Case I.—D. K., a negro male, age 50, had hypertension, syphilis and cardiac insufficiency without organic valvular disease. He had suffered from increasing dyspnea for one and one-half years and had had edema for two months. At the time when his dyspnea first began he had had several extremely severe attacks of precordial pain, but these seizures had ceased. After rest in bed, digitalis, limitation of fluid and diuretics his edema disappeared. His subjective dyspnea improved somewhat, but Cheyne-Stokes respiration continued to be very marked. He refused almost all food and grew progressively weaker. After four weeks in the hospital he was much emaciated, stuporous, disoriented, incontinent of urine and feces, and was having Cheyne-Stokes respiration with apneic periods of one minute and longer. The administration of dibasic potassium phosphate, in doses of 8 c. c. of a 25 per cent solution thrice daily, was begun, no other change in therapy being made. In ten days the appetite began to improve and after three weeks he ate very abundantly. Cheyne-Stokes respiration gradually improved and eventually disappeared. He regained sphincter control. His mind became clear. Four weeks after potassium was started he left the hospital without any symptoms other than some dyspnea on rapid walking. He remained practically free of symptoms for six weeks and then while talking to some friends in his yard, suddenly sank to the ground, dead. No autopsy was done.

Case II.—A. A., 38, a white man, had cardiac insufficiency without valvular lesion and without hypertension. Several years before, his blood pressure had been high. He was admitted to the hospital repeatedly for breaks in compensation characterized by slight edema and marked dyspnea. After his third "break" he was given dibasic potassium phosphate. That was six months ago and his condition since then has been no better, and possibly somewhat worse than it was before. Certainly no striking beneficial effect was observed. He is still living and can walk about, although he is not able to work.

Case III.—A. D., a white man, 51 years old, was admitted to the hospital repeatedly for breaks in compensation apparently due to hypertension. He first came into the hospital in October, 1927, and was discharged the same month. Subsequent admissions, each time for severe decompensation, were as follows: August, 1928, discharged September, 1928. He returned in December and was discharged in January. This time he remained out of the hospital for only six weeks, returning in February with his fourth severe break in compensation.

In March, 1929, the administration of dibasic potassium phosphate was begun, all other treatment being unaltered. He has had no edema for six months. He can walk slowly with comfort, but is short of breath when he walks rapidly. He has had one severe attack of dyspnea at night, which came after he had been squirrel hunting, and he has had several minor seizures. He seems to be in much better condition than he was a year ago.

Case IV.—T. P., a negro man, 44 years of age, had syphilitic aortic insufficiency. He was first admitted

to the hospital in November, 1928, for attacks of angina pectoris. At this time he was having occasional seizures of dyspnea at night and a little edema of the ankles. He was discharged improved. He returned to the hospital in February, 1929, with marked edema and dyspnea. This disappeared rapidly under the usual management and he was discharged in April. He remained out of the hospital for two months, during which he had a little edema most of the time and frequent attacks of nocturnal dsypnea, as well as some dyspnea and some substernal pain on slight exertion. He returned to the hospital in June, again severely decompensated. After he had been rendered edema-free the administration of dibasic potassium phosphate was begun, other treatment being unchanged. During the next four months he said that he had no dyspnea whatever and no edema. His angina increased in severity, but was temporarily relieved by cervical sympathectomy. In October, 1929, he had a severe attack of precordial pain and died suddenly at home. Autopsy was not done.

Case V.—J. W., a white man of 53, has hypertension and arteriosclerosis. He was admitted to the hospital in January, 1929, with severe dyspnea and moderate edema. He improved somewhat, but after his discharge in February continued to have some edema and had numerous attacks of dyspnea at night as well as severe dyspnea on slight exertion. He returned to the hospital in May with a second and more severe break in compensation. After a week in the hospital he showed only slight improvement. Dibasic potassium phosphate was then administered, the remaining treatment being unaltered. During the next three or four weeks his appetite improved, but otherwise very little change in his condition was noted. After his discharge from the hospital in June he began to feel stronger. He has had no more edema and his dyspnea has practically entirely disappeared. He is leading a practically normal life and says that he feels "better than in years."

Case VI.—G. H., a negro man of 39, had hypertension, syphilitic aortitis without valvular disease and cardiac insufficiency. When he came to the hospital for his second admission he had marked edema and dyspnea. After three weeks' treatment his edema had disappeared, but he was very weak and refused to eat. He was given dibasic potassium phosphate in doses three times larger than any other patient had received. He did not improve. He gradually developed uremia and finally died five weeks after admission with the signs of bronchopneumonia. Autopsy revealed a markedly hypertrophied heart with a few scattered scars; the muscle seemed to be unusually strong. There was an acute exacerbation of a chronic vascular nephritis. The lungs showed bilateral lobar pneumonia. It was our clinical impression that our therapy might have produced the acute nephritis, but the pathologist thought this unlikely. Analyses of this man's tissues showed that the heart, skeletal muscle and kidneys contained less than the normal amount of potassium, although he had been receiving it in massive doses for two weeks. In none of the other cases did any noticeable benefit occur within less than two or three weeks' time.

Case VII.—J. A., a negro man, age 73, had hypertension and arteriosclerosis. He was admitted to the hospital in July, 1929, for cardiac insufficiency and discharged in August much improved. He returned two weeks later in a worse state than before. This time, after he had been rendered edema-free, dibasic potassium phosphate was added to his previous regime. Since he left the hospital in September he has been getting along fairly well, is able to walk around slowly without dyspnea and had had only slight demonstrable edema.

Thus far, the only cases which have been mentioned are those of individuals whose conditions had been carefully studied and whose progress had been unfavorable on the usual plan of therapeutic management. In addition to these patients we have given dibasic potassium phosphate to a number of patients after their initial break in compensation. All of these are doing well, but one would have expected this in any case and, as they were not controlled, the results in these "early" cases mean nothing.

In each of the seven cases which have been reported the prognosis appeared to be very poor before the administration of potassium was begun. Five of them seemed to progress much more favorably when receiving it than they had previously done. However, this result may have been due to chance and we prefer to draw no definite conclusions from the cases.

BIBLIOGRAPHY

1. Corvisart: Diseases of the Heart and Great Vessels. Paris, 1812.
2. Heberden: Commentaries, London, 1812.
3. Withering: Garrison's History of Medicine, Third Ed., p. 368.
4. Laennec: Traite de l'auscultation mediate. Paris, 1819.
5. Louis: Garrison's History of Medicine, Third Ed., p. 429.
6. Hope: Diseases of the Heart and Great Vessels. Edinburgh, 1831.
7. Corrigan: Edinb. Med. & Surg. Jour., 27:225, 1832.
8. Skoda: A biundlung uber Perkussiun und Auskultation. Vienna, 1839.
9. Flint: A Practical Treatise on the Diagnosis, Pathology and Treatment of Diseases of the Heart. Second Edition. Phila., 1870.
10. Bright: Reports of Medical Cases, London, 1827.
11. Stokes: A Treatise on the Diagnosis and Treatment of Diseases of the Chest. The New Sydenham Society, London, 1882.
12. Mackenzie: Disease of the Heart. London, 1925.
13. Weuchebach: Die Unregelmassige Herztatigkut. Leipsig, 1914.
14. Lewis: The Mechanism and Graphic Registration of the Heart Beat. Third Edition. London, 1925.
15. Rhode: Zeitschr. f. phys. Chemie., 68:181, 1910.
16. Visscher and Starling: Jour. Physiol., 62:243, 1927.
17. Christian: Diseases of the Heart, p. 135. Oxford Monographs, New York, 1928.
18. Wearn: Personal communication.
19. Takeuchi: Jour. Physiol., 60:208, 1925.
20. Harrison and Pilcher: Jour. Clin. Investigation. In press.
21. Hill, A. V.; and Lupton, H.: Quart. Jour. Med., 16:135, 1922-23.
22. Gremels and Starling: Jour. Physiol., 61:297, 1926.
23. Eppinger, Kisch and Schwarz: Das Versagen des Kreislaufes. Berlin, 1927.
24. Neuschlosz: Archiv. f. d. ges. Physiol., 213:19, 1926.
25. Patterson, Piper and Starling: Jour. Physiol., 47: 465, 1914.

INJECTION METHOD OF TREATING VARICOSE VEINS: REASONS FOR ITS POPULARITY*

By BERTRAM M. BERNHEIM, M.D., F.A.C.S., Baltimore, Md.

The injection method of treating varicose veins is receiving well-deserved recognition. Eminently satisfactory, simple of execution and practically devoid of danger, it has practically supplanted the operative method of treatment, and in spite of the fact that operation was quite successful. The only trouble was, that it was an operation, and a rather difficult one, and operation meant hospitalization, expense and loss of time from work. One would be less than human did he not prefer this newer method which avoids all that.

There is nothing especially new about the injection of varicose veins other than the solutions used. The idea was expounded more than seventy-five years ago and thereafter many trials were made. The solutions were unsatisfactory in that they did not cause the desired clotting with sufficient regularity; considerable discomfort accompanied their use and rather frequent sloughs followed the injections. Embolism, curiously enough, never was an outstanding feature but it was always feared, so what with the unsatisfactory experiences in general, the method failed to attract, and operation maintained its position as the chief method of treatment.

With the lapse of time and continued effort certain solutions were found which, when injected within the veins' lumen, not only caused satisfactory clotting with great regularity, but were rather painless and harmless. To the French must go most of the credit for this, although certain Americans, namely, Tunick[1] and McPhetters,[2] took an early interest. So that now one has at his command a number of different substances, salt solution, glucose, sodium salicylate, and others, any one of which or combinations of which may be relied upon to give constant results if used properly. It is not surprising therefore, that operation has been practically given up. And as if to make more certain the widespread use of the injection method, recent clinical observations have shown that embolism is a rare occurrence in connection with varicose veins whether clot formation within their lumen come as a consequence of natural (infection) or artificial (injection) means.[3]

I have gotten my best results by using a mixture of 50 per cent glucose and 30 per cent salt solutions in equal parts. Five to 10 c. c. are usually injected at a sitting, starting with one of the veins low down below the knee and in successive sittings working gradually upwards, depending upon the extent of the thrombosis produced at the preceding treatment. I do not use a tourniquet, but have the patient either stand or sit with the leg hanging down. In this way the vein to be injected bulges and there is more or less of a blood stasis within it. A little iodine or alcohol is placed on the skin and a small-bore needle inserted. Having withdrawn a small amount of blood first in order to make sure the needle is in the vein lumen, the solution is slowly injected. The needle is then withdrawn and a dry sponge put over the site of injection and fixed with a bit of adhesive. A pressure bandage to be worn a few days is then applied and the patient permitted to depart.

I prefer the mixture of salt and glucose because it lessens the likelihood of slough formation if some of the solution should accidentally get out of the vein and into the surrounding tissues.* One tries to prevent this by withdrawing some blood before starting the injection and thereafter by holding the needle as steady as possible and by applying pressure at the site of injection the moment the needle is removed. Even so, it occasionally happens that the vein wall has been doubly punctured, that the needle point slips out of the vein a bit or that there is a leakage around the needle. If salt solution has been used by itself a slough is much more liable to occur than if it has been mixed with glucose. It is true that destruction of the lining endothelium of the vein and the clot formation is not quite so satisfactory with glucose alone or with the mixture of glucose and salt as it is with salt alone, but to all intents and

*Received for publication January 10, 1930.

*Another very satisfactory solution is quinine hydrochloride and urethane which can be obtained at most drug stores already put up in 2 c. c. ampoules, sterilized and ready for use. I use this chiefly in the smaller veins.

purposes it is adequate and the advantages seem to outweigh the disadvantages. In some cases there is a rather sharp pain in the vein under treatment coincident with the injection or immediately following it. This is probably due to contraction of the vessel, but while annoying it is of no importance. It usually lasts from five to fifteen to twenty minutes. Certain patients prefer to lie down during it, but others disregard it.

Following the treatment the patient is permitted to follow his or her usual activities. Most of them have little or no discomfort, but upon occasion, with the onset of extensive clotting, the veins become a bit sensitive and the skin over them sometimes gets rather red and hot, much like a mild inflammatory process. An ice-bag gives relief, but whether one applies this or not, the process in my experience does not progress to any extent, being more in the nature of a chemical reaction than anything else. Many cases, perhaps the majority, do not have it. Certain ones do, though, and mention is made of it because the inexperienced may mistake its nature.

The clot formation may be quite local but, on the other hand, it may extend a considerable distance from the site of injection. Once having formed, it goes on to organization much like any other type of thrombus and the process of vein obliteration comes to pass as a consequence in the usual course of events and with the lapse of time. The whole thing may take some weeks or several months, but long before it is over the patient experiences that symptomatic relief for which treatment was sought.

Contra-indications are but few. General physical examination prior to treatment is naturally advisable, especial reference being had to the presence of diabetes. One hesitates to introduce considerable quantities of glucose into the circulation if the urine contains sugar. And an acute phlebitis had best be overcome before further strain is placed upon the venous circulation. In the presence of ulcers, too, one must use caution, though the blocking of veins in their vicinity, if done carefully, hastens their healing.

But one of the beauties of the method is that it can be utilized over long stretches of time. It is quite possible to initiate a course of treatment, interrupt it, and start it at will. This is comparable, of course, to the removal of offending veins in stages, depending upon the fancy of the patient or the circumstances of the case; but with the injection treatment there is no loss of time whatsoever through hospitalization or invalidism. Certain individuals find themselves in such a position, from one cause or another, that they desire to have handled only the worst vein segments.

There is, however, still another angle of the situation that is receiving increasing attention, namely, the obliteration of small unsightly vein prominences: those minor varicosities that were rarely operated upon because the resultant scar was as bad if not worse than the veins themselves and because people did not care to go to the hospital and run the risk attending operation for such small things. With the injection method these can be obliterated without difficulty, as can the stellate conditions that are seen frequently in the skin of both the upper and lower leg. One injection of 2 to 3 c. c. into the small vein sinus from which the little venules radiate usually suffices to clear them up in short order. It is really most satisfactory. Nor is this to be regarded purely in the light of a beautifying procedure, since many of the smaller vein dilatations are but the forerunners of greater varicosities.

In short, the injection method of treating varicose veins is simple, satisfactory, less dangerous than operation, and avoids the expense attendant on hospitalization, to say nothing of that which comes with loss of time from work. Furthermore, it lends itself not only to the cure of major vein dilatations but is equally efficacious as a means of preventing their development.

REFERENCES

1. Tunick, I. S., Dubin, S. and Schmier, A.: The Injection Treatment of Varicose and Ulcers of the Lower Extremities. Amer. Jour. Surg., New Series, Vol vi, No. 4, April, 1929.

2. McPheeters, H. O.: Varicose Veins. F. A. Davis Company, Phila., 1929.

3. Bernheim, Bertram M.: Fatal Emboli from Thromboses of Great Blood Vessels; the Concealed Thrombus. Sou. Med. Jour., Vol xxii, No. 5, May, 1929, pp. 464, 466.

1814 Eutaw Place.

THE MANAGEMENT OF ECLAMPSIA IN THE NEGRO RACE*

By C. B. Upshaw, M.D.,
Atlanta, Ga.

The management of convulsive toxemia in the negro race is not different from that in other races except as we may consider it to be influenced by certain hygienic and sociological factors. In the management of any medical problem the results are largely influenced by the social, educational and financial status of the patient. In no other disease, perhaps, with the exception of tuberculosis, are these factors so influential and important as in the toxemias of the expectant mother.

This paper is in the nature of a report upon the convulsive type of toxemia developing in the colored division of Grady Hospital. It has to do largely with the incidence of the disease, the methods of handling and the results obtained. This Hospital is municipally controlled, with free wards only, and is under the direct management of Emory University and is used for instructing medical students. The patients are the usual types who attend a charity hospital. The intelligence, education and home environment are very poor. Many are youthful unmarried girls with poor judgment, no sense of responsibility and often influenced by superstition rather than reason. Despite many handicaps, we have noted a gradual improvement in the mortality and morbidity from year to year. With a desire to determine if the better results were actual and constant or only apparent, a survey of all eclamptic cases was attempted. If an actual decrease in the mortality rate is found, then those factors responsible for this improvement are sought in this inventory.

Eight years is taken as the period of time for this survey, which extends from October 1, 1921 (which was the opening date of this Hospital) to October 1, 1929.

We shall limit our discussion to those patients actually developing convulsions. There were 152 such cases, which we shall refer to hereafter as eclamptics. The 9,730 admissions include all confinement cases and, in addition, all abortions, premature labors, observation cases, readmissions and neglected cases.

*Read in Section on Obstetrics, Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

*From the Department of Obstetrics, Emory University School of Medicine.

TABLE I

Admissions	
All wards of the Hospital	36,568
Obstetrical (26 per cent)	9,730
Classified as	
Pre-eclamptic	593
Eclamptic	152
Total toxic cases	745

(One toxic case to every 13 obstetrical admissions)
Incidence of eclampsia, 1.5 per cent.
Williams (Hopkins) reports 11,000 cases with 110 (1 per cent).
Lichenstein (Leipzig) reports 14,836 cases with 400 (2.38 per cent).
McPherson (New York) reports 120,000 cases with 890 (.75 per cent).

For the first three years, less than 25 per cent were of the nephritic type of toxemia. Since the treatment is very much the same for both types of toxemia, no attempt is made to classify or to differentiate the types in the remaining series.

With 152 patients developing convulsions in 9,730 admissions, we have an incidence in eclampsia of 1.5 per cent, or 15 cases per one thousand obstetrical cases.

The following data is taken from the case records of 152 eclamptics:

TABLE II

Eclamptics (number developing convulsions)	152
Primiparae	103
Multiparae	43
Not stated	6
Deaths of mothers (mortality 21 per cent)	32
Stillborn infants (mortality 34 per cent)	52
(Infants delivered in poor condition and dying before dismissal of mothers not included)	
Moribund cases (dying within 12 hours)	9
Corrected mortality (per cent)	15
Mothers	
Delivered in home and brought to Hospital	8
Dying undelivered	2
Twin pregnancies	5
Convulsions	
Before or during labor	129
Post partum only	23
Patients attending prenatal clinic (one or more visits) (36 per cent)	55
Blood Wassermann	
Positive (17 per cent)	26
Negative	113
Not stated	13
Average age of mothers (years)	20.9
Patients 20 years of age or less	90
(One gave age as 13; 7 were 14 years of age)	
Patients developing convulsion as early as sixth month	4

One patient developed 44 convulsions, all post partum, and recovered. Another pa-

tient developed 26 post partum convulsions with recovery, and a third developed 23 convulsions during labor and the puerperium, but recovered. Tweedy observed that after 30 convulsions all recovered. Only 8 of the 32 cases which died attended the out-patient clinic one or more times.

The blood sugar was taken in 44 patients with an average reading of 87. The non-protein nitrogen was taken in 44 patients with an average of 32.5.

TABLE III

MANAGEMENT

Bag inductions or bag and catheter	35
Forceps delivery	12
Version and extraction	1
Cesarean section (one had deformed pelvis; both recovered)	2
Post mortem cesarean (one living baby)	2
Venesection	21
Manual dilatation of the cervix	4
Number given magnesium sulphate and dextrose treatment	65

One death occurred in a case with pyelitis; marked kidney destruction was shown at autopsy. Two died of pneumonia, one died from infection on the tenth day, and another died from infection, having been delivered at home by a midwife. One patient died in twenty minutes after admission; another died fifty-five minutes after admission.

The management in our series has been very conservative with but few exceptions. As will be seen, only two cesarean sections were done, one upon a deformed pelvis. In the early part of our series before the staff was well organized and a fixed policy had been established four manual dilatations of the cervix were done.

For comparative purposes we have divided the eight-year period into two equal four-year periods. The first period extends from October 1, 1921, to October 1, 1925, and the second period from October 1, 1925, to October 1, 1929. The incidence and mortality rate are seen in the following table:

TABLE IV

First Period—October 1, 1921, to October 1, 1925	
Number admissions	4,321
Number eclamptics	79
Incidence (per cent)	1.82
Deaths (mothers)	23
Mortality (per cent)	29
Stillbirths	25
Mortality (fetal) (per cent)	31

Second Period—October 1, 1925, to October 1, 1929	
Number admissions	5,409
Number eclamptics	73
Incidence (per cent)	1.35
Deaths (mothers)	9
Mortality (per cent)	12
Stillbirths	27
Mortality (fetal) (per cent)	36

For the first four years or more the routine treatment for a patient entering the Hospital in convulsion was about as follows: morphine sulphate grains ¼ to ½ given to control convulsions. The high colonic irrigation was given every six to twelve hours to "detoxify" the patient. A stomach tube was passed and after lavage with sodium bicarbonate, either castor oil or croton oil was left in the stomach; often quinine was added. Then 400 to 600 c. c. of blood was drawn in plethoric individuals. Little opportunity for rest was allowed the patient. The principle of keeping the patient quiet and free from the effect of external stimuli, which are supposed to precipitate convulsions, was more often violated than observed. Labor was induced by bag or catheter or by both. During labor, morphine was given in sufficient dosage to prevent restlessness and convulsions.

During the last three or four years gradual changes in the treatment have been made. To control the convulsions, we usually give one hypodermic of morphine grains ¼ and then follow with 20 c. c. of 10 per cent magnesium sulphate intravenously. This is given hourly if necessary to control the convulsions. (It is rare that more than one hypodermic of morphine sulphate grains ¼ is given.) The magnesium sulphate is given three to five times if necessary. If more than five doses are necessary to control the convulsions (and this has been very rare) it is given intramuscularly and not more than 15 grams are given in twenty-four hours. This is said to be a safe margin. If coma is present it is not necessary nor desirable to administer magnesium sulphate. After the patient becomes quiet 300 c. c. of 25 per cent dextrose solution is given intravenously very slowly. This is repeated each twelve hours. No blood is withdrawn. The dextrose is given twice daily throughout labor and for three days following labor, and is continued once daily for two or three days following. Labor is induced by the most conservative method, by bag or by catheter or by both. The colon irrigation and gastric lavage have been discontinued. It was felt that the disturbance of rest by frequent and prolonged irrigation and the disturb-

ance of passing a stomach tube outweighed the possible good to be accomplished. Again, in the colon irrigation given by colored undergraduate nurses there is the danger of contamination. More recently we have undoubtedly had a lessened mortality and morbidity from infection.

In a recent series we have been attempting the induction of labor by rupturing the membranes and administering pituitary extract in small doses a few hours later. In all cases thus far labor has been successfully induced. This is after the method of Delbert Jackson of Boston. He believes this to be of great practical value for the general practitioner and those without hospital facilities. It is claimed to be much safer from the standpoint of infection than the insertion of bag and catheter. No ill effects upon the baby have been noted. It would seem to be of great advantage in the primipara with uneffaced cervix and high presenting part. The one great danger is of prolapsed cord. A large series will be necessary before this can be advocated generally.

In the second series we show a decreased mortality rate from 29 to 12 per cent. In the last 42 cases only two maternal deaths have occurred. In the last 15 cases receiving magnesium sulphate and dextrose, not one has developed convulsions after this treatment was begun.

No doubt several factors are responsible for this decreased mortality rate. Undoubtedly, the better organization of our prenatal department has been very influential in this improvement. This department was just organized and beginning to function when this series was started. Then it was attended by less than a dozen patients a week. Now from 125 to 140 patients are in attendance weekly. A delivery room supervisor has been added and a visiting nurse is working in the out-patient department. However, we must conclude that the administration of dextrose and magnesium sulphate is of positive value to the patient with convulsive toxemia. From our experience we attribute the lowered mortality and morbidity largely to these two agents. Eclampsia is an entity the cause of which is yet unknown. Consequently there is no specific treatment and empiricism still prevails. Just how the dextrose is beneficial is not known. Whether its presence in the blood stream exerts a protective influence upon the liver, as Paul Titus believes, or its beneficent results are due to its diurectic effect and to the systematic administration of fluids and nutrition to the tissues, as Stander believes, is not clear.

No untoward or ill effects of either magnesium sulphate or dextrose have ever been noted upon either mother or baby. This appears to be a safe, comparatively simple and a highly effective method in combating the toxemia developing in pregnancy.

33 Ponce de Leon Avenue, Northeast.

Discussion follows paper of Dr. Johnson, page 392.

CESAREAN SECTION UNDER SPINAL ANESTHESIA IN THE LATE TOXEMIAS OF PREGNANCY*

By HERMAN W. JOHNSON, M.D., F.A.C.S.,
and
ROBERT A. JOHNSTON, M.D., F.A.C.S.,
Houston, Tex.

Our part in the present symposium is to report 25 cases of late toxemia of pregnancy delivered by cesarean section under spinal anesthesia. B. G. M. Astley[1] reported a small series of cases in 1927.

We are, however, more interested in the etiology of eclampsia than its treatment. Working in conjunction with Dr. H. O. Nicholas,[2 3 4] we have published three papers in an effort to establish the theory that the late toxemias have a common etiological basis. This common basis is infection, principally by organisms of the *B. coli* group, which may convert the excess amino acids of the blood, or those of the placenta if they are available, into poisonous amines. The amino acids of the blood may become excessive with a high protein intake, deficient elimination, or by reason of a nephropathy. The amino acids of the placenta become available for conversion when the placenta has suffered a circulatory accident, hemorrhage or infarction. The sequence of events may be: infection, high amino acid content of blood with the formation of amines, circulatory accidents of the placenta or adjacent tissues followed by the rapid formation of larger quantities of poisonous amines. The amino acid most commonly utilized is tyrosine, and the poisonous amine most commonly found is tyramine.

*Read in Section on Obstetrics, Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

Even up to the present time statistics with reference to the maternal mortality in eclamptic toxemia are so overwhelmingly in favor of conservative treatment, being 4 to 9 per cent against 20 to 27 per cent for surgical treatment, that the obstetrician feels, when confronted by them, that any departure from conservatism involves undue risk to the patient. He has accepted the additional risk of surgery in those cases complicated by well recognized indications for section. In a large majority of cases the conservative treatment is still adhered to, but developments during the past three years have caused us to scrutinize cases more carefully. This study of the individual case, considering the patient and the baby first and the toxemia second; disregarding for the moment stereotyped treatments; and considering carefully the facts which we shall presently cite, has caused us to resort to surgery with increasing frequency. The facts just alluded to are:

(1) The pathology of eclampsia, unless it has progressed beyond a certain point, improves when the placenta is removed or ceases to function, as in death *in utero*. It is, therefore, a safe assumption that the toxin bears some relationship to the placenta. Therefore, in urgent cases the quick removal of the placenta may be advisable.

(2) The mortality in the toxemias seems to bear a definite relationship to the degree of shock given the patient in terminating the pregnancy or labor. *Accouchement force*, bagging, forceps, anesthesia and surgery without nerve blocking all produce shock.

(3) Stander,[5] in 1926, showed that the blood chemistry in the toxemia of pregnancy is quite like that produced by the inhalation anesthetics.

(4) Cesarean section by the obstetrician has never had the same mortality as that of the general surgeon. The reason is obvious. The surgeon sees the case late and the patient generally has not had the advice of an obstetrician.

(5) Since the general adoption of the operation, popularized by DeLee, the danger of rupture of the uterus in subsequent pregnancy has been remarkably minimized.

(6) The fetal mortality in eclamptic toxemia under the conservative treatment is appalling. It approaches 50 per cent, according to Williams,[6] and 20 to 50 per cent according to DeLee.[7]

(7) Spinal anesthesia with infiltration of the abdominal wall enables one to terminate the pregnancy with a minimum amount of shock.

Our experience with spinal anesthesia has been so gratifying that we feel there are now available two methods of terminating the pregnancy which are practically free from shock: first, the conservative treatment of rupturing the membranes and then refraining from any interference until late in the second stage; or second, cesarean section under spinal anesthesia. The conservative treatment would be advised in all mild and uncomplicated cases, and especially for the general practitioner. Where operating conditions are ideal the radical treatment under spinal anesthesia may be used to advantage in the severer and complicated cases. If the radical treatment lowers the fetal mortality without increasing the maternal mortality it is certainly justified.

In making a decision in a given case we are inclined to consider factors which formerly seemed trivial when compared to the hazard of surgery under inhalation anesthesia. The condition of the cervix may be the determining point for section, as every one realizes the frequency of cerebral hemorrhage in the toxemic baby where the resistance of the soft parts is unusual. We are inclined to give the premature toxemic baby the advantage of an easy birth. There are two in the series which could hardly have survived the trauma of birth. Elderly primiparas are considered. Lesser disproportions than were formerly regarded as necessary are taken into account. The so-called "social indication," where a former child has been lost or invalided by a birth injury, especially if the parents are advanced in years, often warrants a section. In most of the toxemic "dystocia dystrophy syndrome" cases our experience shows that better results were obtained by section.

In these 25 cases of the late toxemia of pregnancy no differentiation is made between the eclamptic and nephritic types. The period covered is from September, 1927, to date, during which time the writers delivered more than 1,400 cases with a total number of cesarean sections of 53. Of the 25 cases which this paper reports, 20 were delivered by the writers, two by our associate, Dr. Fred B. Smith, and three by local obstetricians who had called us in consultation, and who did the section under spinal at our suggestion.

A brief analysis of the cases shows that 20

were primiparas and five multiparas. In addition to the toxemia, the following abnormalities were present:

Of the passages	
Generally contracted pelvis	4
Fibroids	2
Rigid cervix	5
Extensive repair operation	1
Of the passengers	
Prematurity (less than 1,500 grams)	3
Excessive size	5
Abruptio placentae	1
General conditions	
Indication for sterilization	1
Dystocia dystrophy syndrome	1
Grave eye changes	3
Elderly primipara	10
Social condition	4

Nine of the cases had convulsions prior to operation
Highest blood pressure prior to operation, 220/135
Lowest blood pressure during operation, 85/50
Smallest baby (now 18 months old), 2 3/8 lbs.
Maternal mortality, nil
Infant mortality, 1

(This baby was lost in the abruptio placentae case, as was one premature which weighed under 1,500 gms.)

The technic of spinal anesthesia is too well known to require detailed description. We have been encouraged and assisted in our work by Dr. Peyton R. Denman, of Houston, and by the work of Pitkin. One ampoule containing 1/32 grain of strychnine sulphate is mixed with 3 grains of novocain. This, when diluted with 1 c. c. of spinal fluid, has a specific gravity of 1.025. With the patient lying on her side and the pelvis slightly lower than the shoulders, this solution is injected into the canal between the second and third lumbar vertebrae, partially withdrawn, and slowly reinjected. In ten minutes the solution is fixed, the patient is turned on her back, and the skin at the site of the incision is injected.

A nickeloid spinal needle with blunt bevel, one edge sharp and one rounded, is used. Two-thirds grain of ephedrin is in readiness. In only one case did it seem advisable to use it.

Blood pressure records are made before and after the spinal injection, before the uterus is incised, and frequently during the operation.

In two cases not included in this report the canal could not be entered. Inability to do so was due to anatomical peculiarities or to our lack of skill, and the operation was done under an inhalation anesthesia.

In one case the needle broke, leaving 1¾ inches of it deep in the tissues. The space above was injected and the operation was completed. Twelve days later the needle was removed with no untoward results. This accident should be carefully guarded against. Two cases developed headache which might be attributed to the spinal puncture.

SUMMARY

We still believe that in a great majority of cases of late toxemia of pregnancy the conservative treatment is the one of choice, but that spinal anesthesia offers a means of terminating pregnancy in selected cases with a minimum amount of shock. It allows one to be more liberal in the indications for section where this would accrue to the interest of the baby. The fetal mortality in eclamptic toxemia under conservative treatment is appalling and any method of lowering it is worthy of consideration.

BIBLIOGRAPHY

1. Astley, B. G. M.: Spinal Anesthesia in Cesarean Section for Toxemia of Pregnancy. Amer. Jour. Obst. and Gyn., 13:83-86, Jan., 1927.
2. Johnston, Johnson and Nicholas: Toxemia of Pregnancy. Texas State Jour. Med., 23:394, 1927.
3. Johnson, Johnston and Nicholas: Report of Further Study of the Poisonous Amines as the Etiology of Toxemias of Late Pregnancy. Texas State Jour. of Med., 24:696, 1929.
4. Johnston, Johnson and Nicholas: Focal Infection in Eclampsia and Further Study of Tyramine as the Etiological Factor of the Toxemia. Ibid. 25:515, 1929.
5. Stander: Amer. Jour. Obst. and Gyn., 12:633-654, Nov., 1926.
6. Williams: Obstetrics, Fifth Edition, p. 620.
7. DeLee: Principles and Practice of Obstetrics. Fifth Edition, p. 391.

DISCUSSION (*Abstract*)

Symposium on Eclampsia, Papers of Dr. King, Drs. Schwarz and Dorsett, Dr. Upshaw and Drs. Johnson and Johnston.

(Papers of Dr. E. L. King, "Liver Function Tests in Toxemias of Pregnancy," and Drs. Schwarz and Dorsey, "Further Observations on the Conservative Treatment of Eclampsia," appeared in the April Journal, pages 285-293.)

Dr. Percy W. Toombs, Memphis, Tenn.—In accord with Dr. King, I believe that the phenoltetrachlorphthalein or bromsulphthalein tests (preferably the latter) are important in determining the presence or absence of liver damage and as an aid in differentiating the nephritic and the purely toxemic types. In teaching institutions and even in private hospital practice, such tests should be used to support the clinical findings.

I do not think there is any doubt that the toxin of hyperemesis is essentially different from that of pre-eclampsia and eclampsia. The icteric index determination would be much simpler to carry out under the average hospital facilities, if its further use proves valuable in such cases.

The Schlessinger test as an index to the progress of toxic patients, if properly interpreted, should undoubtedly be useful. Its simplicity is much in its favor.

In private practice the physician's knowledge of his patient's past history enables him in most instances to determine the neurotic type of hyperemesis, and a

close observance of the clinical symptoms does much toward the diagnosis and treatment of the toxemia of late pregnancy.

It is highly essential that tests of this nature be used in teaching institutions, as it is by such types of research that we may progress in our understanding of the pathology and treatment of toxemias.

I agree in the main with the treatment outlined by Dr. Schwarz. The idea of trying the conservative treatment for the purpose of determining whether the case is a mild or severe one is very good. There is no doubt that the mild cases will recover if left alone, and if we decide early about the severe cases the chances for the life of both mother and child are undoubtedly enhanced.

In regard to the question of blood dilution before delivery, I have nothing to say. It is interesting, however, to compare the work of Schwarz and Dieckmann and that recently done by Titus, with the observations made by Stander, Plass and Bogart.

I should like to ask Dr. Schwarz if he still uses his old method of giving glucose and what his experience has been with the instrument of Dr. Titus. I should also like to know if he uses insulin with glucose or if he thinks there is indication for it if the urine specimen is negative for sugar.

I can best discuss the paper of Dr. Upshaw by comparing his data with that of the maternity division of the Memphis General Hospital. This is the teaching institution of the University of Tennessee College of Medicine, and it has a large number of negro patients. In a series of 80 cases of eclampsia in the colored race studied over a period of six years there were 38 ante partum, ten intra partum, and 32 post partum eclamptics. By contrast, in the number of deaths we find 21 ante partum, two intra partum, and one post partum, showing that we are not concerned so much in the last two groups as we are in the first, which is contrary to the usual teaching. In this series the majority of deaths (15) occurred within twelve hours after admission and died undelivered. These were of the acute fulminating type of eclampsia and had been in convulsions from one to six hours before being seen by our service.

The 80 cases were treated as follows:

Elimination only	5
Elimination and morphine	31
Elimination, phlebotomy and morphine	21
Elimination, phlebotomy, morphine and intravenous glucose	1
Elimination, glucose and magnesium sulphate (intravenously) and phlebotomy	6
Elimination, glucose and intravenous magnesium sulphate	15
Cesarean section (post eclamptic)	1

The operative incidence of the series was as follows:

Bag induction	2
Cesarean section (eclampsia interim)	1
Forceps (intra partum eclampsia)	2
Version (forceps attempted, contraction ring)	1

I have dedicated my service to the conservative treatment of eclampsia. Our records show that this treatment is advantageous. We believe that the chief results to be obtained from the intravenous administration of magnesium sulphate are found in its action in effecting dehydration and diuresis. With its use as a sedative we have had fair results only. We believe that the intravenous or intramuscular injection of magnesium sulphate has no place in the treatment of pre-eclampsia. It has not reduced blood pressure nor does it affect the toxic symptoms. In eclampsia it has no effect on blood pressure, but is a constant diuretic and dehydrant. Its sedative action is irregular.

Cesarean section may be indicated in certain selected cases. It remains for further research to select these cases.

Dr. Warren E. Massey, Dallas, Tex.—Dr. Johnson has spoken of this meeting as being a conservative one. My medical life has been spent under the influence of a rather extreme conservatism. I have come to feel that, instead of using the terms "conservative" and "radical" we should think of the treatment of any disease, and particularly eclampsia, as correct or incorrect. A long-continued conservative treatment many times becomes as super-radical as the hasty operative procedures are radical. Each treatment is correct under certain different conditions. The true treatment of eclampsia consists in prenatal care and prevention, and in an effort to avoid those conditions which demand a choice between the so-called conservative and radical procedures.

I have had a good deal of experience with the type of patients of which Dr. Upshaw speaks. In our Clinic at Baylor University, in Dallas, the students under supervision deliver each school year six or seven hundred cases. Many of them are seen the first time after labor has begun. Environment, lack of knowledge, lack of prenatal care and lack of means to care for themselves have much to do with the condition of the patient's health at the time of delivery.

Dr. King raises the question of what we should do in our experimental work in teaching. He has impressed it upon my mind to the extent that I shall try to carry on that form of instruction, and to teach the students what they may accomplish by watching the patient before eclampsia develops.

Dr. Schwarz's paper should impress upon all of us the seriousness of the condition. Too few of us realize the injury and destruction of tissues and functions which culminate in the state of eclampsia. When we realize the progression in pathological development which accompanies the progression of the clinical symptoms, we will redouble our efforts in prevention of the disease.

Dr. Joseph E. Green, Richton, Miss.—I claim to be a specialist myself. My specialty lies from the top of the head to the end of the long toe, and includes everything in the human skin. I know that many of you are just like myself. You come from either Rattlesnake Den or Dry Creek, and it is you who are going to treat the majority of these unfortunate expectant mothers.

It is illuminating to come from time to time to hear this splendid teaching in these fine papers, but a little sad when you compare the mortality of twenty years ago with that of today and find that they are on nearly the same line. It always makes me a little sad when I hear these splendid men read papers such as we have heard this morning, because I cannot get to them when I get into trouble, nor to men of their type.

The doctor from Atlanta spoke of the very young mothers among the negroes. They are about thirteen or fourteen years old in Mississippi, and this applies also to the white race. We fellows from Rattlesnake Den will probably find ourselves fifteen or twenty miles from a nurse or a hospital, away in the night. with bad roads, and the mother has had no prenatal care in a majority of cases. We rush the patient to a

hospital, in many cases a charity hospital, and some immature interne who is longing to do a cesarean does it, and later we have two pieces of paper to sign with him.

If you did not make a study of these conditions we should not get anywhere, and we are thankful for this sugar and salt in eclampsia. But what are we going to do in a jam? My advice is to start in low and go slowly, rattle your instrument case across the floor and say, "I am going to have to use instruments." That will do the trick in a majority of cases.

Dr. Robert L. DeNormandie, Boston, Mass.—We used to operate and deliver the eclamptic patient as soon as she came into the hospital, and we used to lose many patients. It is best first to start the elimination and then to do operative work if it is necessary. It is not a question of conservative or radical treatment; it is a question of right or wrong. A cesarean section on a separated placenta you may call radical; I call it conservative. The point is, it is right or wrong treatment.

Liver function studies have not helped us clinically or in the prognosis.

We have had three deaths about Boston under spinal anesthesia. There was no real indication for using this technic. Would you want it done on your own wife? If you would not, then you have no business to use it on somebody else's.

Dr. J. Bay Jacobs, Washington, D. C.—I agree with Dr. Massey. The matter also was referred to by Dr. DeNormandie, who emphasized the advisability of shortening labor for the benefit of the patient, and also I think for the benefit of the fetus. This in the hands of an obstetrician who is well trained and possesses operative skill is good obstetrics and not radical. If it is done by one who is unqualified, it is radical.

In eclampsia, the performance of cesarean section is radicalism. The application of forceps in the case of a fully dilated cervix, in either a pre-eclamptic or an eclamptic, although an operative procedure, is conservative treatment.

Generally, this subject is not properly defined for students and practitioners. Much confusion can be eliminated by emphasizing the fact that, depending upon suitable indications, good obstetrical judgment and operative ability, what would appear to be radical obstetrics is well within the realm of conservatism.

Dr. Lester A. Wilson, Charleston, S. C.—There are several reasons why cesarean is not the best method for delivering eclamptic patients. Cesarean causes more shock than any other plan of delivery, and as eclamptics die most frequently from shock, it seems, therefore, that spontaneous delivery or, at least, delivery by the natural route, would be a better method.

Eclamptics are especially susceptible to infection and the trauma caused by cesarean increases the area in which infection may take place.

These patients are hard to manage. They often get out of bed or sit up and the muscular action incident to further convulsions may break the sutures. For these reasons cesarean is a dangerous procedure in eclampsia.

Dr. T. B. Sellers, New Orleans, La.—I should like to call your attention to one point of differential diagnosis between eclampsia and nephritis that has not been mentioned. In the nephritic cases the blood pressure, early in pregnancy, is usually from 135-150 and gradually runs up; in the eclamptic cases, the blood pressure, in the beginning, is not above 120, and from my observation, as pregnancy progresses, the blood pressure drops. In many of my cases the systolic blood pressure drops to 90 or below. If the blood pressure starts high and goes up, you may be certain that you are dealing with the nephritic type; if, at the beginning of pregnancy, it is normal, or even below normal, drops during the first four or five months and then rises suddenly about the fifth or sixth month, you may be certain that you are dealing with the pre-eclamptic type.

I agree with Dr. DeNormandie as to the use of spinal anesthesia. I came to this conclusion following an experience with it at the Charity Hospital several years ago. I realize that with the more recent technic developed by Dr. Pitkin and others it is safer than it formerly was. Why resort to radical measures when local anesthesia will give you better results?

Dr. King (closing).—In the treatment of eclampsia the essential point is prenatal care. In our text-books we were taught that we should see our patients every month during the first seven months and every two weeks thereafter. Every two weeks in the last two months is not enough to see the obstetrical patient. In practically all services at the Charity Hospital, and in my private work and teaching of medical students, we see the patient every week in the last two months. Why? Because I have had several cases of eclampsia which developed in patients whom I had seen ten or twelve days before. A recent report from Johns Hopkins Hospital on 77 cases of eclampsia stated that 21 women being treated in their outpatient dispensary had developed eclampsia. These patients had been visiting the prenatal clinic every two weeks in the last seven months of pregnancy.

The blood pressure is important. I had a case of eclampsia in a private patient a year ago, whose blood pressure was 130 one week before she developed eclampsia. Her normal blood pressure was between 90 and 100. If I had studied her earlier in her pregnancy and had found the blood pressure climbing I should have been alarmed, but I was not under the circumstances.

One of the French writers warns against blood pressure of 130 to 150 in pregnancy. Our own text-books do not indicate that we should be particularly worried until the blood pressure is 150 to 160. I have seen a woman die of eclampsia with the blood pressure just over 145. I know of nothing that can tell us what is going to happen in a given case of toxemia of pregnancy. My personal reaction is this: in a woman with toxemia of pregnancy, the combination of elevated blood pressure with albuminuria is bad. When patients do not improve, it seems to me that the nearer they are to term the more quickly we should terminate the pregnancy. We gain little by temporizing, and if we are losing ground, why temporize? If the patient is near the end of pregnancy we can induce labor and get a live baby; if she is only six or seven months, what chance have we to carry her through to nine months and save the baby or the mother? Very little. We may lose both.

Cesarean section in a pre-eclamptic condition is permissible in a few cases. We have been handling most of them by the induction of labor. We must get them early. Do not wait until they are on the ragged edge and try then to induce labor. I believe that in eclamp-

sia and in all the toxemias of pregnancy the time to use cesarean section is before the eclampsia develops, not during the attack.

Dr. Otto H. Schwarz, St. Louis, Mo.—I had not time in my presentation to speak of other phases of treatment. In teaching post-graduates we are frequently asked why we do not use veratrum viride or venesection. We do not use either of these, owing to the marked drop in blood pressure which we have observed frequently after delivery. This condition is analogous to shock, and we feel that veratrum viride and venesection just prior to delivery might further increase the occurrence of shock. The drop in blood pressure is sometimes as much as 100 mm. of mercury. To avoid this we stimulate the patient with pituitrin, put sand bags on the abdomen, and if necessary give intravenous injections of glucose. This does not in all instances prevent the drop, but the patient usually responds to the stimulation and the blood pressure again rises. These drops in blood pressure are more pronounced in cases of eclampsia where a cesarean section is performed under an anesthetic. They occur to a less degree under local anesthesia.

In cases of eclampsia, I should like to ask Dr. Johnson why he does a lower segment incision, and why he uses a spinal anesthesia? We prefer the classical section in these cases with local anesthesia. Also does Dr. Johnson note a marked drop in blood pressure with the use of spinal anesthesia in these cases?

In answer to the gentleman from Mississippi I may say that in giving post-graduate courses we discuss various methods in the treatment of eclampsia. To the men who are unable to get their patient to a hospital, we recommend the Stroganoff treatment, which can be carried out anywhere.

Dr. Upshaw (closing).—Our fetal mortality is about the same as Williams reports in Baltimore and as that reported in other large clinics. I had expected some comment upon the high fetal mortality in eclampsia. I believe it will be lowered only by more adequate prenatal care and intelligent cooperation on the part of the patient. Certainly we have not the high fetal mortality rate in our private work which is seen in the clinic cases.

I agree with Dr. Jacobs that one may very easily be ultra conservative in the use of forceps in eclampsia. I feel sure that we are to be criticised for using forceps as few times as we did in our series. Without question it is good obstetrics to shorten the second stage of labor by low extraction in these toxic patients.

Dr. Johnson (closing).—Dr. DeNormandie spoke of the technic of spinal anesthesia. I believe the use of spinal anesthesia is to some extent a matter of where you happen to live. In Houston Dr. Denman has made some valuable contributions to this question and has been successful with it. Many surgeons in Houston use spinal anesthesia. The cases would run into the thousands and they claim their post-anesthetic conditions are much better than under the inhalation method. Dr. Denman urged my partner and me for a long time to let him use spinal anesthesia in cases of eclamptic convulsions. We resisted him for over two years. We were fearful that the thing Dr. Schwarz has mentioned, the quick drop of blood pressure, might be disastrous. But he finally persuaded us to let him give spinal anesthesia to an eclamptic. We encountered no alarming conditions at all. That drop has taken place in practically every case; the only extreme case was one whose systolic pressure fell to 80. Otherwise they were kept at a safe elevation. My partner and I give the spinal ourselves, and I am sure if I were going to do a section on his wife he would want me to do it under spinal anesthesia, because these patients are much more comfortable afterwards. We have had no bad results in 25 cases.

Shock is the thing that kills the eclamptic or pre-eclamptic patient. We must marvel at DeLee's results in what we would call radical surgical treatment. He does a section under local anesthesia, routinely does a cervical section, and we know his results are wonderful. His mortality is less than the published statistics. He has a mortality of around 6 to 7 per cent, and that compares favorably with any treatment I know of. So it is not a question of radical or conservative treatment, but whether it is right or wrong. If cesarean section can be done without additional shock, I can assure you that there is a minimum of shock with spinal anesthesia. I should like to run a series of cases under DeLee's local infiltration. I think it can be shown that the patient is not so happy, is more uncomfortable and suffers more pain than under spinal.

We use DeLee's retractors and I am sure we can now do a cervical cesarean section as quickly as a classic because we are in the habit of doing it. There is less danger of rupture at a subsequent pregnancy.

A METHOD FOR DETERMINING THE LIFE DURATION OF THE ERYTHROCYTE: II. THE RATE OF RED CELL PRODUCTION AFTER HEMORRHAGE*

By PAUL EATON, M.D.,
and
F. L. DAMREN, DR. P.H.,
Augusta, Ga.

In another paper[1] we presented a new method for determining the life duration of the erythrocyte, together with the experimental evidence on which we based an estimate of eight and one-half days for the average life of the red cell of the rabbit. Although our findings seemed definite enough to warrant publication, the fact that they were based on one experiment naturally demands their confirmation.

The method is based on the following theory. If a deficiency in the number of red cells be repaired promptly, there will be in the blood an unusual number of red cells of about the same age. If the normal variation in the life span of these cells be not too great, a sufficiently large number of them will die nearly enough at

*Received for publication January 14, 1930.

*From the Medical Department, University of Georgia.

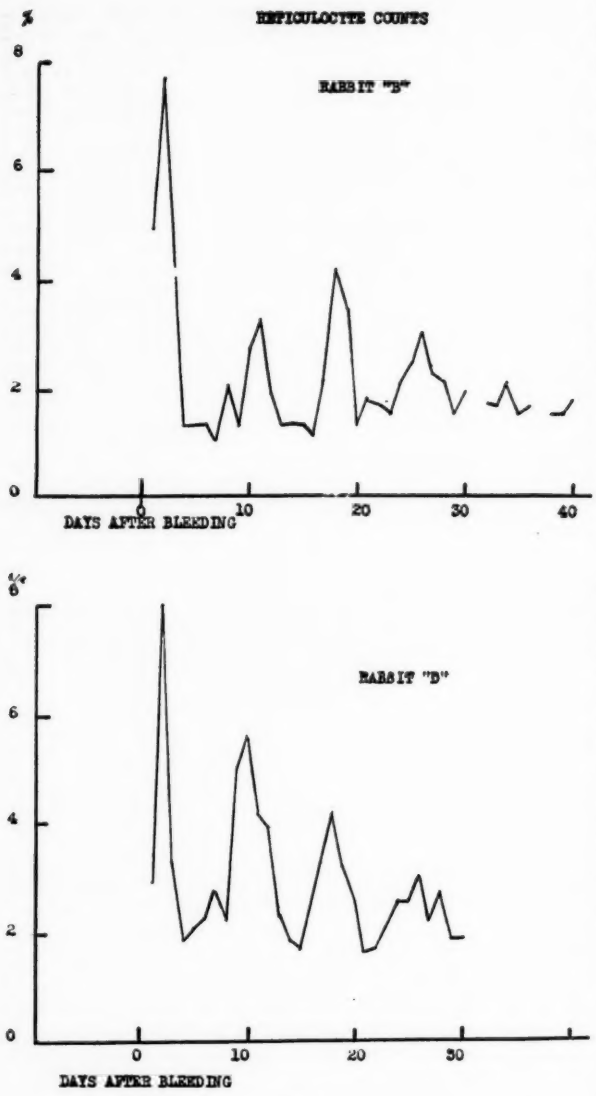


Fig. 1

the same time to impose on the red cell producing mechanism a second strain. This series of phenomena will recur until the normal variation in the life span of the red cells has ironed out the irregularities in destruction and production. To state the theory in other words, an animal that has suffered any considerable loss of red cells, whether by hemorrhage or otherwise, will experience a series of spontaneous anemias at regular intervals corresponding to the average life of the red cells, and the number of times this recurs will be a function of the frequency distribution of the variable in question.

It has long been known that there is an early stage in the life history of the red cell duing which it contains material that can be differentiated by the process of vital staining. This material is the remains of a reticulum that surrounds the nucleus in the normoblast. It gradually disappears, first changing from a wreathed or fibril form to a punctate or dotted form. We have designated these two stages of development Type "A" and Type "B," respectively. In the normal rabbit they are present in the proportion of three "A's" to one "B."

Under normal conditions the number of reticulocytes in the blood suffers a slight daily fluctuation indicating a rhythm in marrow activity. After any loss of red cells there is an increase in the number of reticulocytes. After any considerable loss of red cells the increase in the percentage of reticulocytes is marked. Our theory demands that the successive spontaneous anemias that we have predicted shall cause waves in the percentage of reticulocytes that shall be of sufficient size to be easily detectable, separated by intervals which must correspond to the value of the mode of the frequency distribution of the length of life of the red cell.

Table I gives the daily reticulocyte counts for each of two rabbits which had been subjected to the withdrawal of about 25 per cent of their respective blood volumes, directly from the heart, under very light ether anesthesia. The blood smears were made as nearly as possible at 10:00 a. m. each day.

For Rabbit "B," the subject of the experiment detailed in our previous report, the normal was established by averaging nine consecutive daily counts previous to bleeding. For Rabbit "D" the normal was arrived at by averaging nineteen

counts made over a period of thirty odd hours two days before the bleeding. The data of *Table I* are presented graphically in *Fig. 1.*

TABLE I

Daily reticulocyte counts on Rabbits "B" and "D"

	"B"	"D"
Mean prior to bleeding	1.43%	1.53%
Days after bleeding		
1	4.95	2.96
2	7.69	8.01
3	6.00	3.30
4	1.30	1.83
5	1.28	2.09
6	1.36	2.36
7	1.06	2.54
8	2.07	2.25
9	1.32	5.02
10	3.70	5.61
11	4.31	4.22
12	1.95	3.96
13	1.36	2.31
14	1.45	1.88
15	1.45	1.78
16	1.20	2.65
17	2.21	3.38
18	4.19	4.26
19	3.56	3.26
20	1.34	2.60
21	1.81	1.64
22	1.64	1.71
23	1.50	2.14
24	2.08	2.60
25	2.42	2.61
26	3.06	3.04
27	2.26	2.33
28	2.18	2.76
29	1.56	1.88
30	1.89	1.92
31	Missed	Died
32	1.73	
33	1.69	
34	2.12	
35	1.58	
36	1.66	
37	Missed	
38	1.48	
39	1.51	
40	1.74	

The two curves in *Fig. 1* show striking differences as well as resemblances. In the case of Rabbit "B," after the first peak the curve drops to its pre-operative level and stays down pretty well for six days. This seems to indicate that the restoration of cell numbers was tolerably complete. The same thing happened after each of the succeeding peaks. We may say that in this rabbit the mechanism governing the restoration of cell numbers was so efficient that the total loss of red cells was made up in seventy-two hours.

In the case of Rabbit "D" the replacement of cells does not seem to have been so complete at the peak times since the interpeak values are slightly higher than the pre-operative average. On the other hand, this rabbit may have been suffering from some previous disturbance of his blood making system. There is of course room for variability in type of behavior in different individuals, but one thing which our experiments demonstrate very clearly is that one should never imagine he knows all there is to know about the state of a rabbit's red cell producing system until he has made at least eight consecutive daily reticulocyte counts on the rabbit's blood. Something may have happened to the rabbit at any time within the forty days immediately preceding a single count which is still being reflected in the behavior of the erythropoietic system. This fact may shed light on some of the discrepancies in the literature concerning the reticulocyte.

As a result of the study of these two curves we are constrained to revise our first estimate of eight and one-half days for the life of the rabbit's red cell to eight days.

It is plain that when one is studying a phenomenon of but eight days' duration observations made at twenty-four hour intervals will not permit very fine deductions. For this reason we planned our second experiment to give sixteen observations every twenty-four hours over the first peak. There are in our record some regrettable lacunae due about equally to error, blunder, and accident; but on the whole the findings confirm a priori reasoning in a manner so gratifying that we are encouraged to present them rather fully.

THEORETICAL CONSIDERATIONS

This discussion is based on the assumption that all red cells, even those developed under abnormal conditions, will behave in the same manner so far as concerns the time they take to pass through the reticulocyte stage, and particularly as to the relative time they spend in the two stages we have described.

The red cell population is not a static system. It must be studied in the light of the balance which is maintained between production, function, and destruction. Particularly must production be studied as a flowing quantity. We must find some way of correlating the results of the ordinary methods of measuring the quantities involved with the instantaneous rates of production.

If the average life duration of the red cell is eight days, two hundred hours is a close enough approximation for some crude figuring. Under ordinary circumstances the reticulocytes comprise about 1.5 per cent of the whole number of red cells, and the reticulocyte stage may therefore be assumed to last 1.5 per cent of two hundred hours, or three hours. If there are three times as many "A's" as "B's" the A stage lasts two and one-quarter hours and the B stage lasts forty-five minutes.

Let us divide each 1,000 red cells into 250 forty-five minute age groups; that is to say into age groups corresponding to the duration of the "B" stage. There will be in each group four cells. The first three age groups comprising twelve cells will be Type A reticulocytes. The fourth age group of four cells will be Type B reticulocytes. The remainder will be ordinary

adult red cells, indistinguishable from each other so far as we know now. Let us further agree to consider the four cells in each age group as the total output of the red cell producing system during a certain infinitesimal portion of time, these successive infinitesimals of time being separated by intervals of forty-five minutes. In other words, let us agree that for eight days the instantaneous rate of red cell production figures on this basis, has been four. Now it is plain that the abstraction of 25 per cent of the animal's blood will change neither the total reticulocyte count nor the ratio subsisting between the two types of reticulocytes. It will merely leave three cells where there had been four.

(It may be pointed out here that from the moment of bleeding until the arrival of the second peak the death rate among the red cells by reason of old age will be but three-fourths of what it was before bleeding, of which more later.)

Consider now *Table II* in which the columns represent the age groups just described and the rows represent the successive infinitesimals of time above referred to.

It will be seen that if the normal rate of red cell production were to continue after bleeding, the effect would be to increase the percentage of reticulocytes and to diminish the percentage of the Type B reticulocytes.

If, on the other hand, the combined influence of the shock of the operation, the anesthetic, and the ef-

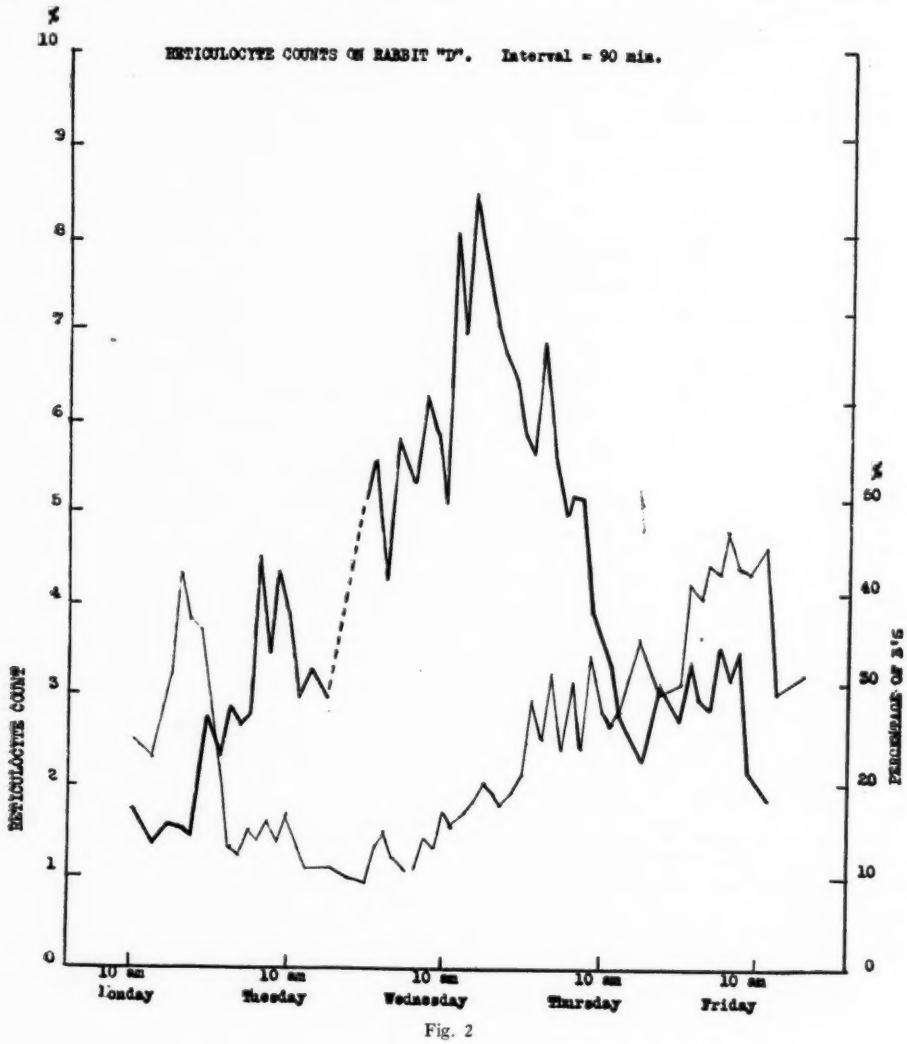


Fig. 2

TABLE II

	A			B										
	1	2	3	4	5	6	7	8	9	.	.	.250	Total	A B / Total	B / A B
	4	4	4	4	4	4	4	4	.	.	.	1000	1000	1.600%	25%
Normal	3	3	3	3	3	3	3	3	.	.	.	.	750	1.600	25
Production	4	3	3	3	3	3	3	3		.	.	.	751	1.731	23
After	4	4	3	3	3	3	3	3	.	.	.	.	752	1.861	21
Bleeding	4	4	4	3	3	3	3	3	.	.	.	.	753	1.992	20
	4	4	4	4	3	3	3	3		.	.	.	754	2.122	25
Lowered	4	4	4	4	4	4	4	4			.	.	1000	1.600%	25%
Production	3	3	3	3	3	3	3	3			.	.	750	1.600	25
After	2	3	3	3	3	3	3	3			.	.	749	1.468	27
Bleeding	1	2	3	3	3	3	3	3			.	.	747	1.204	33
	1	1	2	3	3	3	3	3	.		.	.	745	0.939	43
	1	1	1	2	3	3	3	3	.		.	.	743	0.673	40
	1	1	1	1	2	3	3	3	.		.	.	741	0.539	25
Secondary	2	1	1	1	1	2	3	3			.	.	740	6.608	20
Increase	3	2	1	1	1	1	2	3	.		.	.	740	0.946	14
in	4	3	2	1	1	1	1	2	.		.	.	741	1.349	10
Production	5	4	3	2	1	1	1	1	.		.	.	743	1.884	14
	6	5	4	3	2	1	1	1	.		.	.	746	2.413	16
	7	6	5	4	3	2	1	1	.		.	.	750	2.933	18
	8	7	6	5	4	3	2	1	.		.	.	755	3.444	19
	9	8	7	6	5	4	3	2	.		.	.	761	3.942	20
	10	9	8	7	6	5	4	3	.		.	.	768	4.427	21

forts of the body to restore blood volume, and so forth, should tend to diminish the rate of production the effect would be to lower the total reticulocyte count, and to increase the percentage of B's. A subsequent increase in the rate of production would of course reverse these values. It should be noted here that in either case, if at any time the rate of cell production, be it high or low, should remain constant for so long as three hours, the result would be to restore the normal percentage of Type B reticulocytes.

With these theoretical considerations in mind we are ready to study the results of the experiment on Rabbit D which are presented in detail in *Table III* and in graphic form in *Figs. II* and *III*.

The various items in the table are self-explanatory with the exception of the columns headed "Differential Count" and "T." The differential count gives the percentage of Type B reticulocytes as determined by typing one hundred reticulocytes. Under the heading "T" this percentage if given was calculated from the total reticulocyte count. Since the latter usually involves a smaller number of cells it is less reliable.

Fig. II is plotted on ordinary cross section paper, while *Fig. III* is on semi-log paper for convenience in comparing rates of increase and decrease.

It will be seen that the forty-eight hour period of increase in the percentage of reticulocytes divides itself into two parts as to slope. After the initial fall in production there was a period

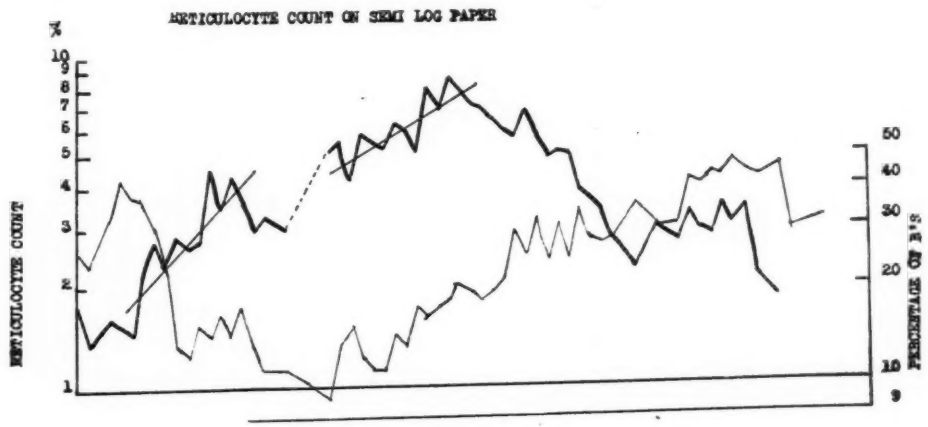


Fig. 3

TABLE III

Slide Number	Day	Hour		Total Cells	Reticulocytes: Type "A"	Reticulocytes: Type "B"	Reticulocytes: Total Percentage		Percentage of Type "B's" Based on: Differential Count	Percentage of Type "B's" Based on: Total Count
1	6/14	11:30 a.m.		1216	13	1	14	1.15	29	
2	"	1:00 p.m.		1037			16	1.54	27	
3	"	2:30		1032	8	5	13	1.26	27	
4	"	4:00		1032			17	1.65	26	
5	"	5:30		1035	10	6	16	1.55	24	
6	"	7:00		1051			14	1.33	26	
7	"	8:30								
8	"	10:00								
9	"	11:30								
10	6/15	1:00 a.m.		1042			16	1.54	27	
11	"	2:30		1049	10	4	14	1.33		29
12	"	4:00		1087			18	1.66	31	
13	"	5:30		1025	10	4	14	1.37		29
14	"	7:00		1007			15	1.49	27	
15	"	8:30		1136	13	3	16	1.47	28	19
16	"	10:00		1153			18	1.56	26	
17	"	11:30								
18	"	1:00 p.m.		972			17	1.75	30	
19	"	2:30		988	9	5	14	1.42	33	36
20	"	4:00		1114			19	1.71	30	
21	"	5:30		1121			18	1.61	29	
22	"	7:00		1020			19	1.86	30	
23	"	8:30		999			19	1.90	28	
			Hours after Bleeding							
24	6/17	10:00 a.m.		992			17	1.71	25	
	Bled at	12:30 p.m.								
25	"	1:00 p.m.	½	978			13	1.33	23	
26	"	2:30	2	1280			19	1.48	27	
27	"	4:00	3½	1070			17	1.59	32	
28	"	5:30	5	1056	16		16	1.52	43	
29	"	7:00	6½	1130			16	1.42	38	
30	"	8:30	8	1060			23	2.17	37	
31	"	10:00	9½	1075			30	2.79	30	
32	"	11:30	11	1000			23	2.30	22	
33	6/18	1:00 a.m.	12½	1031			29	2.82	13	
34	"	2:30	14	984			26	2.64	12	
35	"	4:00	15½	975			27	2.77	15	
36	"	5:30	17	1021			46	4.50	14	
37	"	7:00	18½	1071			37	3.45	16	
38	"	8:30	20	1010			44	4.35	14	
39	"	10:00	21½	1067			39	3.66	17	
40	"	11:30	23	1012	27	3	30	2.96	13	10
41	"	1:00 p.m.	24½	980			32	3.26	11	
42	"	2:30	26							
43	"	4:00	27½	970			29	2.99	11	
44	"	5:30	29							
45	"	7:00	30½						10	
46	"	8:30	32							
47	"	10:00	33½	973			50	5.14	9	
48	"	11:30	35	1146			64	5.58	13	
49	6/19	1:00 a.m.	36½	1194			51	4.27	15	
50	"	2:30	38	983			57	5.80	12	
51	"	4:00	39½	1111			61	5.50	11	
52	"	5:30	41½	971			52	5.36	11	
53	"	7:00	42½	1081			68	6.29	14	
54	"	8:30	44	1074			63	5.87	13	
55	"	10:00	45½	1039			53	5.10	17	
56	"	11:30	47	1110	78	11	89	8.01	16	
57	"	1:00 p.m.	48½	1111			77	6.94	17	
58	"	2:30	50	1048			89	8.49÷	18	
59	"	4:00	51½						20	
60	"	5:30	53	1017			72	7.08	19	
61	"	7:00	54½	994			68	6.85	18	
62	"	8:30	56	976			63	6.46	19	
63	"	10:00	57½	1087			64	5.89	21	
64	"	11:30	59	1063			60	5.65	29	
65	6/20	1:00 a.m.	60½	1109			76	6.86	25	
66	"	2:30	62	1120			63	5.62	32	
67	"	4:00	63½	1202			59	4.91	24	
68	"	5:30	65	1007			52	5.17	31	
69	"	7:00	66½	1096			56	5.11	24	
70	"	8:30	68	1025			40	3.90	34	
71	"	10:00	69½						28	
72	"	11:30	71	1001	21	12	33	3.30	27	36
73	"	1:00 p.m.	72½	1023			28	2.74	28	
74	"	2:30	74							

TABLE III—Continued

Slide Number	Day	Hour		Total Cells	Reticulocytes Type "A"	Reticulocytes Type "B"	Reticulocytes Total Percentage		Percentage of Type "B's" Based on Differential Count	Percentage of Type "B's" Based on Total Count
75	"	4:00	75½	1016			23	2.26	36	
76	"	5:30	77	981			26	2.60		
77	"	7:00	78½	1002			31	3.09	30	
78	"	8:30	80							
79	"	10:00	81½	963			26	2.70	31	
80	"	11:30	83	1015	34		34	3.36	42	
81	6/21	1:00 a.m.	84½	976			29	2.97	41	
82	"	2:30	86	1065			30	2.82	44	
83	"	4:00	87½	972			34	3.50	43	
84	"	5:30	89	1068			34	3.18	48	
85	"	7:00	90½	1009			35	3.47	44	
86	"	8:30	92	1021	15	7	22	2.15	43	32
87	"	10:00	93½						46	
88	"	11:30	95	1033			19	1.83	46	
89	"	1:00 p.m.	96½						30	
90	"	2:30	98							
91	"	4:00	99½							
92	"	5:30	101						32	
			Days after Bleeding							
93	6/22	10:00 a.m.	5	1005	14	7	21	2.09		33
94	"	4:00 p.m.								
95	6/23	10:00 a.m.	6	1015	18	6	24	2.36		25
96	"	4:00 p.m.								
97	6/24	10:00 a.m.	7	984			25	2.54		
98	"	4:00 p.m.								
99	6/25	10:00 a.m.	8	977			22	2.25		
100	"	4:00 p.m.								
101	6/26	10:00 a.m.	9	1016			51	5.02		
102	"	4:00 p.m.								
103	6/27	7:00 a.m.								
104	"	8:30							25	
105	"	10:00		1087			61	5.61+		
106	"	11:30								
107	"	1:00 p.m.								
108	"	2:30								
109	"	4:00								
110	"	5:30								
111	"	7:00								
112	"	8:30								
113	"	10:00								
114	"	11:30								
115	6/28	1:00 a.m.								
116	"	2:30								
117	"	4:00								
118	"	5:30								
119	"	7:00								
120	"	8:30								
121	"	10:00		1019			43	4.22		
122	"	11:30								
123	"	1:00 p.m.								
124	"	2:30								
125	"	4:00								
126	"	5:30								
127	"	7:00								
128	"	8:30								
129	"	10:00								
130	"	11:30								
131	6/29	10:00 a.m.	12	1009			40	3.96		
132	6/30	10:00	13	995			23	2.31		
133	7/1	10:00	14	1064			20	1.88		
134	7/2	10:00	15	1067			19	1.78		
135	7/3	10:00	16	1056			28	2.65		
136	7/4	10:00	17	1007			34	3.38		
137	7/5	10:00	18	986			42	4.26+		
138	7/6	10:00	19	1042			34	3.26		
139	7/7	10:00	20	1037			27	2.60		
140	7/8	10:00	21	1035			17	1.69		
141	7/9	10:00	22	993			17	1.71		
142	7/10	10:00	23	1028			22	2.14		
143	7/11	10:00	24	961			25	2.60		
144	7/12	10:00	25	996			26	2.61		
145	7/13	10:00	26	985			30	3.04+		
146	7/14	10:00	27	1030			24	2.33		
147	7/15	10:00	28	1129			31	2.76		
148	7/16	10:00	29	1116			21	1.88		
149	7/17	10:00	30	1140			22	1.92		

of almost twenty-four hours during which the percentage of reticulocytes tended to double itself every twelve hours as shown by the trend line drawn across the curve. There is a very unfortunate gap in the record at the end of this period, but it can easily be seen from the percentage of B's that the production of cells was going on at a very rapid rate. From this time on, however, the rate of increase in the rate of production falls off, tending to double itself but once in twenty-four hours.

The curve for the percentage of Type B reticulocytes behaves exactly as demanded by the theory outlined. Whatever be the nature of the stimulus which brings about the increased production of cells, its operation is characterized by periods of rest, but these periods never last as long as three hours.

Our findings tie themselves in very nicely with a theory recently developed by Krafka[2] to account for the production of endogenous uric acid. He believes that the extruded nuclei of the normoblasts furnish this substance. The rate of its production and excretion should therefore parallel the rate of red cell production. His curve for the excretion of uric acid by a Dalmatian hound which had been subject to a 30 per cent hemorrhage, very closely parallels our curve for percentage of reticulocytes. That is to say, there is a high rate of output for forty-eight hours after bleeding and then a rate even lower than normal corresponding to the lowered rate of cell destruction (and consequent production) between the peaks of our curves. Our results seem to add cogency to his argument.

In each of our experiments the bleeding was done about midday and the height of the first peak was attained about noon of the second day thereafter. Whether this time relation would hold if the bleeding were done say at midnight remains to be determined by experiment.

Without any direct bearing on the matter in hand is the fact that the very close scrutiny involved in the counting of more than 150,000 cells in the experiments on these two rabbits did not reveal a single nucleated red cell. This suggests that the nucleated red cell instead of being merely the expression of a hyperactivity of the marrow system, may have an immunologic function, since it is common in infection.

SUMMARY

Reticulocyte counts have been made on more than 100 blood smears made over a period of thirty days from a rabbit which had been subject to the loss of twenty-five per cent of his blood. Fifty-six of these smears were made at intervals of one and one-half hours over the first hundred hours of the experiment.

The preoperative level of reticulocytes was established by averaging nineteen counts made over a period of thirty odd hours two days before bleeding.

A series of spontaneous anemias was indicated by high reticulocyte counts on the tenth, eighteenth, and twenty-sixth days after bleeding; following the highest count of eight per cent on the second day. The interpeak values were comparable with the preoperative level.

The most important finding seems to be the fact that the ratio between two readily distinguishable types of reticulocytes furnishes the most delicate and precise measure of the activity of the erythropoietic system. Its indications are the more important and valuable in that they relate to what has been happening in the red cell producing system in the three hours immediately preceding the test.

BIBLIOGRAPHY

1. Eaton, Paul, and Damren, F. L.: A Method for Determining the Life Duration of the Erythrocyte: I. Sou. Med. Jour., Vol. xxiii, No. 4, April, 1930, pp. 311-319.
2. Krafka, J.: Journal of Biological Chemistry.

CHRONIC HYPOGLYCEMIA*

By H. M. WINANS, A.B., M.D.,
Dallas, Texas

Harris,[1] in 1924, reported several cases of hypoglycemia, the symptoms of which so closely resembled the picture of insulin shock that he gave to it the name of hyperinsulinism. Cammidge,[2] in the same year, reported a case in which the symptoms were much less acute, but in which the blood sugar was uniformly at a low level. Since then many cases have been reported, most of them having a definite pathological basis, such as tumor of the pancreas. It has become evident, however, that there are patients who have no discoverable organic lesion, but who nevertheless have low blood sugars and frequently show an abnormal response to the sugar tolerance test. Cammidge,[2] again in 1927, went into the question thoroughly and his work,

*Read in Section on Medicine, Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

together with that of Pribram,[3] established a group of individuals showing weakness, pallor, tremor, emotional instability, various forms of headache, loss of ability for sustained effort and mental concentration.

It is apparently true that patients in good health may be found who have a low blood sugar during fasting or even at certain periods in the day. Those apparently normal people may show either a hyperglycemic response or an increased tolerance upon the ingestion of glucose. In the case of a hyperglycemic response it may be that the usual diet is high in carbohydrates and that the continued ingestion of more carbohydrate than is necessary over stimulates the pancreas to a point where it is beginning to show relative insufficiency. If an increased tolerance is shown it is felt that the pancreas has been over stimulated by the high carbohydrate diet but that it is able to respond by the over production of insulin. Furthermore, if the individual has been accustomed to a diet below caloric requirements of the body or one in which the carbohydrate percentage is relatively low this diet may fail to provide sufficient stimulation for the pancreas and at first a hyperglycemic response to the sugar tolerance test may occur. In this instance a tolerance test repeated the next day or after an increased ingestion of carbohydrates may show normal response. (Lennox).[4]

It is difficult to predict at what point in chronic hypoglycemia the symptoms may appear. It is likely that so long as there is no definite failure on the part of the pancreas to respond and if there is no great over-response the individual will do fairly well. Undoubtedly other factors in the patient's environment influence the development of symptoms. Mental stress and worry, acute infections, and particularly over-exertion, may bring on the symptoms of hypoglycemia. Unfortunately for the patient the early symptoms of increased appetite may lead him into a vicious cycle in which the increased intake of food has the effect of producing still more stimulation of the pancreas and ultimately still more marked symptoms. It is a common characteristic that these patients tend to gain weight under circumstances which ordinarily cause the normal individual to lose, and the influence of the hypoglycemic stimulation of the appetite in these instances cannot be doubted.

Although the entire question of blood sugar determinations and normal levels is still a matter of argument, it will be assumed, for the present purpose, that with the Folin Wu method of determination a level between 85 and 110 mg. is normal. That between 70 and 85 mg. is a group showing mild symptoms, while below 70 mg. the symptoms become more acute passing on down to true shock. In a glucose tolerance test after the administration of 60 grams of glucose there should be a rise of at least 40 mg.

The following causes have been assigned for chronic hypoglycemia, exclusive of the effects of insulin:

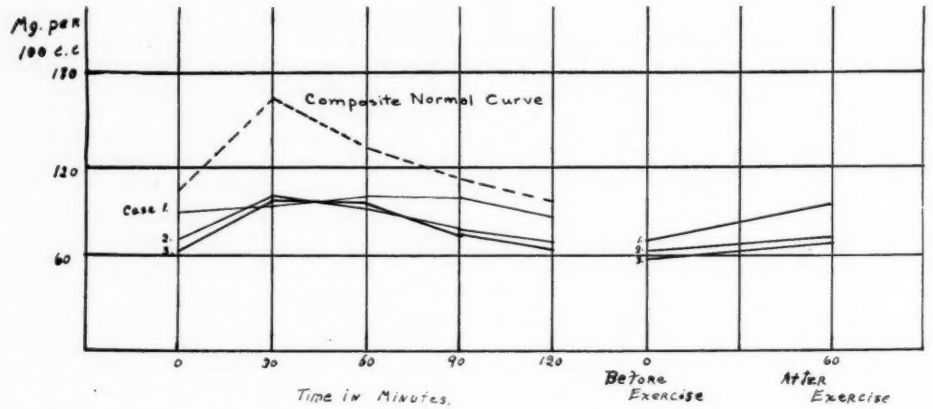
(1) Endocrine disturbances.
(2) Progressive muscular dystrophy.
(3) Allergy (Malone[5]).
(4) Physical exhaustion (depletion of glycogen reserve).
(5) Sub-total thyroidectomy.
(6) Lowered renal threshold with loss of glucose.
(7) Excessive or altered secretion of the pancreas (Harris[1]).

Of the above causes, endocrine disturbances are perhaps the most difficult to rule out. The tendency to ascribe hypoglycemia to endocrine dysfunction is particularly tempting in view of the profound changes occurring in the blood sugar after the administration of pituitary extract, thyroid and adrenalin. In the present state of our knowledge concerning endocrine disturbances, however, it is much safer to assign them as a cause only in those cases in which there is an obvious endocrinopathy. Allergy as a cause deserves much study, but in the cases observed so far its influence could not be detected. The following cases illustrate some of the aspects of hypoglycemia:

Case I.—An executive in a busy office complained of severe headaches and inability to concentrate which appeared nearly every afternoon about 4 o'clock. The headache was disabling and not relieved by any ordinary drugs. It would disappear in the course of outdoor exercise and, in fact, never troubled him if he were exercising. A thorough study was made of every factor which might be causing his trouble, although the temptation to make a diagnosis of neurosis was very strong. It was significant, however, that when his headache appeared his blood sugar was 78 mg. The sugar tolerance curve, after the administration of 1.75 grams of dextrose per kilogram of weight, rose only from 88.8 mg. fasting to 98.5 mg. at the end of one hour, and at the end of two hours was down to 85.5 mg. After the administration of pituitary extract his sugar rose to 163.2 mg. It dropped at the end of two hours, however, to 60 mg. The afternoon sugar was lower than his morning fasting sugar and was 73.2 mg. A study of his previous diet showed that it was very largely carbohydrate. He ate very little protein, because he thought it was bad for him, and very little fat because he gained weight easily. His lunch was mostly carbohydrate.

Case II.—A woman who had previously gained weight rapidly complained of extreme weakness, trembling and inability to keep from crying. Her ordinary activities became too much for her and she spent much time in bed. Rest in bed did not help her, however, and her general examination was completely negative except for moderately low blood pressure. Her basal metabolism was within normal limits. Her diet contained a high percentage of carbohydrates and she was fond of candy. Moreover, since this trouble had developed she had eaten more than usual in an attempt to gain her strength. Her fasting blood sugar was 81.6 mg. After breakfast it was 84.7 mg. Her sugar tolerance curve showed a rise from fasting sugar of 72.7 mg. to 101 mg. She generally felt very much worse in the afternoons and her blood sugar taken at that time was 59 mgs. After an hour of exercise it rose to 68.9 mg.

Case III.—A woman, age 30, complained that before lunch and in the middle of the afternoon she had attacks of weakness, dizziness, pain in the pit of her stomach and extreme hunger. Her general examination was negative except that she was overweight. Her metabolic rate was within normal limits. Her blood, taken late in the afternoon, showed 67.8 mg. After exercise it rose to 76.1 mg. Her tolerance began at 83.7 mg. fasting, and reached 98.1 mg. after thirty minutes. At the end of two hours it was back to 84.6 mg. She was overweight and attempted to reduce. Since these attacks were accompanied by extreme hunger, she found it necessary to take food. It must be borne in mind, however, that a long period of overeating preceded this difficulty.



The increase in blood sugar in these patients, after exercise, is contrary to what might be expected. Gordon, Levine and Derick[6] found normal, or below normal, blood sugar values in marathon runners. It is true that these patients did not exercise to the extent that marathon runners do and also that they did not show signs of exhaustion after an hour of exercise which consisted of walking, playing golf and horseback riding. The rise in blood sugar might be due to increased liberation of glycogen, increased synthesis of dextrose from lactic acid or inhibition of insulin formation.

Of these possibilities the increased glycogenolysis is the most probable. Contrary to the findings of some other investigators, my patients had most of their trouble later in the day. It might be assumed that breakfast and lunch stimulated the over-production of insulin and that by afternoon hypoglycemia developed. In all three of these patients the afternoon blood sugar reading was lower than the morning fasting value. In the third patient it might be imagined that the food intake balanced the production of insulin under normal circumstances, but that when she began to diet the relative carbohydrate intake was too low and the hypoglycemia then made itself known.

It would seem that in the above cases all cause for the low blood sugar could be ruled out except an altered or excess secretion of the pancreas. It also would be difficult to think that all of these cases could be due to tumor of the pancreas. It is much more reasonable to assume that they had an over-production of insulin due to a diet containing at least a relative excess of carbohydrates. This type of response to carbohydrate intake has now been proved beyond question by sufficient investigation. It is not necessary to expect in all cases an increased tolerance to the administration of glucose. It is much more important to obtain the blood sugar level at the time when symptoms are most prominent. In these cases the fasting sugar was not so low as the sugar obtained later in the day when we should expect the effect of two meals to be most evident.

It is not the purpose of this paper to discuss the treatment of these cases, but it may be said in passing that in so far as a limited number of them are considered they do best with a balanced diet and with regular and systematic exercise. When the symptoms of hypoglycemia become pronounced the taking of a small amount of sugar produces very prompt relief and this relief may be more marked upon the administration of small doses of pituitary extract. In these cases, as in many others, however, the general hygiene of the patient is of supreme importance, particularly as regards systematic exercise taken within the limit of endurance of the patient.

It is apparent that some forms of chronic hypoglycemia may develop simply as a response to excess carbohydrate intake or a diet in which there is a relative excess. It is well known that obesity, presumably from overeating, precedes diabetes. It is also probable that in certain individuals, as long as the pancreas can respond to the over-stimulation of excess diet, they are in the class of chronic hypoglycemia, whereas if the pancreas fails they progress to diabetes.

REFERENCES

1. Harris: Hyperinsulinism and Dysinsulinism. J.A.M.A., 83:729-733, Sept. 6, 1924.

2. Cammidge: Chronic Hypoglycemia. Lancet, 2: 1277-1724, 1924.

2. Cammidge: Chronic Hypoglycemia. The Practitioner, 119:102-112, Aug., 1927.

3. Pribram: Chronic Glycopenia. J.A.M.A., 90:2001, 1928.

4. Lennox: Repeated Blood Sugar Curves in Non-Diabetic Subjects. Jour. Clin. Invest., vol. 4, Aug., 1927.

5. Malone: Hypoglycemia in Allergy. U. S. Veterans' Bureau Med. Bulletin, 5:285-288, April, 1929.

6. Gordon: Levine; Derick: Some Changes in Chemical Constituents of Blood Following a Marathon Race, with Reference to the Development of Hypoglycemia. J.A.M.A., 82:1778, 1924.

7. Hartman: Hypoglycemia. Med. Clin. N. A., pp. 1035-1046, Jan., 1929.

8. Jonas: Hypoglycemia. Med. Clin. N. A., 8: pp. 949-956, Nov., 1924.

DISCUSSION (*Abstract*)

Dr. W. E. Vest, Huntington, W. Va.—Dr. Seale Harris first called our attention in this Section to the fact that there was such a condition as chronic hypoglycemia.

We know that adrenalin may at times upset the blood sugar level. Pituitary extract will give prompt relief in some cases and at times the thyroid has something to do with it. The blood sugar level is cut down by the secretion of insulin, and glycogen from the liver restores it, so that the liver regulates the upward level and the pancreas is the downward regulating mechanism.

Dr. Winan's twilight zone, so to speak, that is, between 70 and 85, is slightly lower than mine. I look upon 80 rather than 85 as a low level and I have not seen any marked symptoms unless the blood sugar level was below 70.

Dr. Winans called attention to the fact that exhaustion or depletion of the glycogen reserve might be a cause of symptoms. It seems to me that that probably takes place, but there must be some other factor in the individual in addition to that. These cases do not seem to follow any general law, and if muscular exertion brought on the symptoms of insulin shock we should have it more often than we do, unless there were some other factor controlling the level of the blood sugar. To say that the general cardiac function is responsible is begging the question. One thing that I believe is responsible, which he mentioned, is the prolonged use of coffee. I cannot help but feel that in certain cases the condition is due to chronic caffein poisoning, caused by the taking of too much coffee.

In the current issue of the *Archives of Internal Medicine* is a report of a case of hypoglycemia in which the pathology at post-mortem was a tumor of the liver. So much of the liver substance was destroyed that the proper amount of glycogen could not be utilized and turned loose in the blood stream. It was a matter of glycogen distribution. The normal amount of insulin was proven to be present and the pancreas was normal.

Dr. T. L. Byrd, Atlanta, Ga.—Hypoglycemia must be considered as a symptom complex and not a clinical entity *per se*. The condition is found in both pathological and physiological states of the organs which have to do with the control of the carbohydrate metabolism in the body, namely: the liver, pancreas, adrenals, thyroid, pituitary and other glands of internal secretion. The degree of the symptoms depends upon the extent of the dysfunction of the above mentioned glands.

Bock and Hoffman, as early as 1874, found that three-fourths of an hour after ligation of the blood vessels, going to and from the liver, sugar disappeared from the blood; and Mann and his co-workers found that five hours after removal of the liver the blood sugar dropped. Substances which have a deleterious effect on the liver, such as hydrazin, chloroform, phosphorus and arsenic, will also cause a hypoglycemia. This has been seen in animal experimentation, as well as in clinical practice. The liver is the only organ where gluconeogenesis occurs, and it is also a storage depot for glycogen; therefore the level at which the concentration of the sugar in the systemic blood is maintained represents the balance between two opposing factors, the consumption of glucose by the tissues and the production of glucose by the liver. The activity of the liver is regulated by the automatic nerve

control, through the splanchnic, and a hormone from the suprarenal glands. The latter liberates epinephrin, which utilizes the glycogen and is most important in the prevention of hypoglycemic syncope. If this mechanism fails to coordinate it is then necessary to give some form of carbohydrate, adrenalin or pituitary extract to prevent distressing symptoms.

In diseases of the pancreas, the usual picture is one of hyperglycemia, but cases have been reported of tumor of the pancreas causing a hypoglycemia with a blood sugar of 35-36 mg. Harris, of Birmingham, Alabama, during 1924 reported a series of cases of hypoglycemia which he classified as due to hyperinsulinism. He was the first observer to describe this important condition. It is reasonable to assume that we can have a hyperfunction of the pancreas, with a resulting hypoglycemia, as well as a hypofunction of the pancreas with a resulting hyperglycemia and diabetes, just as we see hyperthyroidism and hypothyroidism giving opposite symptoms.

My connection with the Good Samaritan Clinic at Atlanta has given me the opportunity to make blood sugar studies on patients presenting different endocrin dysfunctions. Glucose tolerance tests were done on a number of cretins, mongolians, hypothyroid, hypopituitary and hypogonad cases. Some of these showed a normal response to the glucose meal, while others were found to have a high tolerance, with relatively low blood sugar. Some of them had blood sugars as low as the cases under discussion, but they did not show symptoms of hypoglycemia. This may be due to the fact that these individuals live more or less in a state of apathy and their glucose balance is maintained on a much lower level than the average case seen in practice.

The adrenal glands are next in importance in hypoglycemia. It is a well known fact that in most cases of hypoglycemic shock adrenalin will quickly relieve the symptoms. It acts by causing the liver to liberate glycogen. In Addison's disease, one of the outstanding symptoms is hypoglycemia, and a failure of blood sugar response after a glucose meal. Longcope, of Hopkins, recently reported a series of cases of scleroderma with one particular case presenting a typical hypoglycemic syncope. This was first brought to his attention when breakfast was omitted for a basal metabolic test. During this fasting the patient went into a state of confusion, delirium and coma; and a blood sugar taken at this time was 40 mg. The other cases studied did not show this phenomenon, so his conclusions were that hypoglycemia was not due to scleroderma. In a case of severe scleroderma that came to autopsy, the adrenal glands had undergone atrophy.

In conclusion, I wish to say that it behooves us as clinicians to make a most careful study of any patient who presents a hypoglycemia to determine whether we are dealing with a pathological or physiological condition.

THE RELATIONSHIP BETWEEN MIND AND BRAIN IN THE LIGHT OF EPIDEMIC ENCEPHALITIS*

By FOSTER KENNEDY, M.D., F.R.S., Edin.,† New York, N. Y.

At the outset let me say that no acute case of epidemic encephalitis has come under my observation in the past two years. We have, therefore, been led to view with the greatest suspicion any recent case presented to us in these days with this diagnosis. It has always, of course, been clear that an infection flung far and wide through the nervous system would inevitably produce, in different persons, extraordinarily diverse clinical pictures. It becomes, therefore, also inevitable that a disease of such protean nature should be invoked as a possible diagnosis of almost all obscure problems. It, therefore, seems wise at the beginning to assert with vigor that in our experience the condition seems for some years to have disappeared, even the sporadic form.

No disease process, however, that we know has done more to illuminate dark places in neural physiology; nor have we had before such clear authority as encephalitis has given us for a reconsideration of our attitude toward the relationship of body and soul, of soma and psyche.

In the days of pure psychology the mental field was regarded as independent of the body structure; and the psychiatrist is still concerned with the conflict of social customs and biological instinct, to the exclusion of thought regarding the mechanism for mental and emotional production.

We are inclined easily to classify as "toxic deliria" such changes in personality and behavior as occur in some cases of typhoid fever or pneumonia; and, as "psychoses," similar appearing behavior reactions, lacking, however, obvious toxic attachment. To the first group we vaguely assign as causes toxic cerebral states; to the second, we assign environmental difficulties of a sexual or financial or traumatic character. The truth probably lies in the fact that as yet, even with the new stains of gold and silver salts introduced by Cajal and Hortega, we lack adequate histological knowledge of the brain. We

*Read in Section on Neurology and Psychiatry, Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†Professor of Neurology, Cornell Medical College.

are, indeed, very far from being in a position to assert, as we often do assert, that because we can find no morbid changes in the cerebral structure in a case clinically psychotic, no morbid change can possibly exist.

Epidemic encephalitis has aided greatly in supporting this altered point of view. We see, especially in those cases involving the central vegetative field, morbid behavior and morbid emotional states emerge from lesions as organic as are fractured femurs, and we believe that many of these cases furnish valuable data for a future comprehension of neurotic and psychotic phenomena on a physical rather than on a purely emotional or psychic basis.

H. G., aged 21, served as a private in the United States Marines during the War and was supposed to have disintegrated mentally after an alleged attack of influenza in London during the month following the Armistice. He was placed in a hospital for mental diseases for over ten months after his return home, his case diagnosed as dementia precox. The clinical picture was sufficiently confusing; a young man of splendid physique, carried his height of 6 feet 2 inches with a pronounced stoop, an acquisition of his illness. Despite the exclusion of the possibility of syphilitic infection, the pupils were distinctly sluggish to light, the right side of the face definitely flattened in its creases, and there was a fine jelly-like, but most definite, nystagmus on lateral conjugate deviation of the eyes to the right or left. There was pronounced tremor in the extended hands. He had lost over 30 pounds since his illness; but, except for the absence of the abdominal reflexes, great increase in the arm, knee and ankle reflexes and involuntary shivering movements of the pectoral muscles, nothing more of pathological interest could be made out in the sensori-motor system. He suffered, however, from severe nocturnal insomnia, rarely sleeping more than two hours before dawn, after which he would grow drowsy and might sleep three or four hours before noon. Whether he slept or not, during the first part of the day he was utterly inert and exasperated by his inertia. He had the utmost difficulty in accomplishing simple acts, such as shaving, dressing or bathing. He agonized for hours in futile efforts to write a short note or keep an important engagement. In his mental attitude there was not a trace of negativism; he desired passionately to do those things which he could not do at that time, but which later in the day he often could do with relative ease. There seemed to be a distinct resemblance between his inability to perform acts to the completion of which he was urged by will only, without the strong adjuvant of emotion, and the palsy of purely voluntary movements in midbrain encephalitis of the parkinsonian type. Palsies of this kind are often abolished by affective stimulation. He complained often of "numb attacks," during which he felt very cold and during which he shivered and his teeth chattered like a man with a rigor. During these attacks, even in July weather, his rectal temperature was always subnormal, on several occasions being 97° F.; and on his skin were large patches of goose-flesh which covered a third of the body area at a time, and which, under observation, changed their position like a breeze over still water.

In the same general period but not necessarily, and indeed rarely, at the same hours, he had attacks of disturbed breathing rhythm of from a quarter to half an hour's duration. During these attacks he felt as though he could not fill his lungs with air, and he breathed with all his accessory respiratory muscles from fifty-six to sixty-four times a minute. At other times he experienced what seemed like a spasm of the laryngeal muscles and breathed more and more stertorously and ineffectively so that the lips were cyanosed and the eyes protruded. Phenomena such as these have appeared at times in hysteria, and various physicians had considered them hysterical in this case. This explanation, however, would not account for the patient's abnormal thirst for ice water. He consumed for a period of eighteen months between thirty and forty quarts of water every 24 hours and had proportionate polyuria.

An analysis of the initial illness in December, 1918, which he had always considered influenza, revealed the only symptoms to have been severe headache and intense sleepiness by day and by night. Two negative features of value, however, were that he had no feeling of fever and that he had never reported sick to a medical officer. It is highly unlikely that this would be true of any youthful patient with the influenza which was prevalent in London at the end of 1918. Furthermore, after three or four weeks sleepiness disappeared during the night time and was only present by day, a reversal of the sleep mechanism sufficiently familiar to all students of epidemic encephalitis.

This patient's symptoms during the subsequent eight months gradually improved so that he became almost normal, with little or no morning inertia, no difficulty with respiration and no rigors, and his diabetes insipidus became reduced to an intake of only three quarts of water a day.

Another case brought under our observation has afforded a fortunate diagnostic corroboration in that this strange syndrome is to a large degree duplicated. The patient, a boy of 14 years, had a similar polydypsia and polyuria with tremors in the upper extremities, excessive salivation and similar distressing paroxysmal attacks in which breathing was exceedingly rapid, labored and difficult. At these times there was great emotional distress and suffering. In this boy, acute encephalitis occurred two years earlier with visual disturbance, diplopia, fever and excessive insomnia; this was followed for many months by apparent recovery and was then gradually succeeded by a rhythmic incessant coughing and thereafter by the distressing symptoms mentioned.

Another example of seriously deranged metabolism was the case of J. D., a well-developed young man of 24, who had an acute illness accompanied by headache, diplopia, diarrhea and nervousness. Shortly afterward an increasing desire to sleep and difficulty in the use of the right arm, leg and right side of the face appeared. A month later excessive thirst and polyuria developed, and at this time sugar was found in the urine. A low carbohydrate diet for two months improved the glycosuria and entirely relieved his thirst and polyuria. As these symptoms waned a gradually increasing slowness of speech and movement began. In Bellevue Hospital, ten months later, he presented a typical unilateral pseudo-parkinsonian syndrome without any evidence of diabetes mellitus.

Another patient, a woman, aged 28, developed severe hypertrichosis of the face and arms, fol-

lowing encephalitis. Great increase in body weight has been a fairly common sequel of epidemic encephalitis. It happens that this disturbance of metabolism was seen, in our series, only in female patients. One patient within a year gained over 100 pounds. She eventually died, probably of myocarditis. Among five other patients, gains of from 40 to 70 pounds were noticed. The blood sugar was found to be normal in two instances, but in a woman, aged 52, with an increase in weight of 60 pounds, sugar tolerance was below normal. The climacterium as a contributing factor in the increase of weight could be excluded in all but one of our cases.

A well-known physician under my care after a short, acute attack of epidemic encephalitis, characterized typically by stupor, diplopia and slight continued fever, developed an inability to sleep more than four hours in the twenty-four; he had intense motor restlessness, constant elation, a passion for midnight cabaret parties and bursts of talk lasting for hours at a time which he stated he could in no way control. This manic phase lasted eight months and was followed by a year of depression, slowed activity of mind and body, and occasional irritability. The manic-depressive psychosis ran its course after about two years from the beginning of his illness and allowed the patient to resume his normal rather sedate and conscientious personality.

I have described at some length my first case of disturbed vegetative function in the course of epidemic encephalitis, but since that time many instances of dementia precox-like pictures have come to our Neurological Department at Bellevue Hospital and to the Neurological Institute. There have been patients with catalepsy, spontaneous or provoked, with fixed bodily attitudes of bizarre character, with altered personalities fluctuating between docility and paranoid opposition; patients with stereotyped and reiterated words and phrases with persistent closure of the eyelids and retention of urine and feces; garrulity alternating with mutism; ethical defects with flight of ideas and euphoria, and at times markedly anti-social trends. The milder cases, however, have had fantastic neurasthenic symptoms, an agitated anxiety, a loss of confidence and exaggerated shyness, with feelings of unreality and much slow-mindedness.

Some patients suffer from lack of spontaneity and disappearance of all voluntary activity. The emotional tone is apathetic; so that, growing disinterested in business, family or friends, the encephalitic may cease to bother about his condition from sheer apathy and mental powerlessness. Mental asthenia may coincide with hallucinations or delusions of a paranoid character, but more usually there is an irritable nervousness towards himself and an inert indifference towards his environment which for him has become a gray monochrome without significance or form. Such cases usually are sexually impotent, but one sees many instances of greatly increased libido accompanied at times by sadistic behavior. However, in neurology there can often be discerned a certain inevitability in the clinical symptoms emanating from the lesions of structures with known physiological functions. The sympathetic functions, after all, are centrifugal and centripetal; the latter determine the mood of the organism, the former control smooth muscle contraction and glandular secretion. Experimental lesions and disease processes of the thalamus give rise to dissociation between emotional and voluntary activity of muscle, and to alteration in vaso-motor control and respiratory rhythm. Irritation of the head of the caudate nucleus produces emotional mimicry, tachycardia and spastic laughing and crying. Lesions of the hypothalamus and floor of the third ventricle give rise to glycosuria, salivation and increased sweating with, usually, such changes in blood pressure as to bring in their train pathological sleep. Further, we know that tonus in general is under the high control of part of the striatum, and changes in the striatum can give rise to plasticity to the point of catalepsy with tremors and rigidity. Automatic associated movements also are under striatal government: it may be that in paralysis agitans we have an antique expression of both facial emotion and bodily posture.

Such are the results of physiological experiment in these brain areas; and in epidemic encephalitis these same areas are the seat of perivascular round celled infiltration. This is found around the aqueduct also, together with fat accumulation in the ependymal cells of the lateral ventricles and in the tuft cells of the choroid.

I submit that we must correlate these lesions with disorders of personality as we correlate lesions of the thalamus and striatal bodies with athetosis, tics and tremors. By so doing we shall take a notable step towards developing what has not yet been developed, the science of the pathology of mind.

It would be impossible, and the attempt would be tedious, to set down here the innumerable guises in which this disease may present itself: peripheral neuritis, spinal radicular types, myelitic syndromes all appear, dissimilar in symptoms. None is a disease of its own genus; each merely represents a variety in which the virus has fallen with greater incidence on one part of the body than another. Of the circumstances which go to permit this variety of form we know little. Naturally, disease pictures are sketched and colored more by the varying natures of the structures attacked than by the specificity of the invading virus, and variety of picture is furthered because, from lesions of the nervous system, we may have either obliteration of normal functions or release of functions normally controlled by centers higher in the neural heirarchy.

In closing I would again emphasize the importance of those cases of encephalitis in which altered emotional tone is the chief result of the disease. It is often accompanied by altered vital rhythm such as in sleep, respiration, temperature or the intake and output of fluid and sugar. In these cases, too, abulia was the outstanding symptom. We should stress the identity between so-called "functional illnesses" such as the neuroses and psychoses and many of the post-encephalitic sequelae. These latter have come from a peri-aqueductal lesion. Must we look for the cause of the former solely in psychical terms? Must we not cease to be content with a purely mental explanation due to environmental or instinctive stress? Such explanations are useful as far as they go, but so far are they from being an ultimate analysis that they are but figure-skating on the surface of the problem. They have served to make profitable the time that must pass till physiology takes on a larger stature and more definite form; but the neurologist of the future will try by the examination of defects of structure to illuminate defects and perversions of mental function and emotional personality.

So we shall attempt the remarriage of Soma and Psyche. Their divorce was promulgated by the psycho-analysts who long since have cast Soma into outer darkness, whence it would seem profitable to recall him!

TRAUMATIC RUPTURE OF PANCREAS WITH SECONDARY FISTULA: SPONTANEOUS RECOVERY*

By EUGENE B. MAXWELL, M. D.,
Miami, Fla.

A review of the literature concerning traumatic rupture of the pancreas shows that this condition is relatively infrequent and recovery is not the rule. It is noted, however, that in the study of the etiology of cysts and pseudocysts of the pancreas there is a common history of trauma. No doubt, injury to the pancreas is more frequent than is supposed, but the anatomical position of the organ, together with the difficulty of surgical exposure, tends to make the diagnosis of this condition rather difficult. The usual history in cases of traumatic pancreatic cysts is of a severe blow over the upper abdomen which ruptures the organ, after which there is an effusion into the lesser sac of the peritoneum with a resulting localized peritonitis and walling off of the contents. The distribution of the escaping contents following rupture is more easily understood if one recalls that the fetal pancreas is entirely surrounded by peritoneum and that in adult life the posterior layer is converted into connective tissue which forms a capsule.

The question of fat necrosis and hemorrhage following the escape of the secretions is of great interest. It is said that the secretions of the duodenum and upper part of the small intestine are necessary to activation of the pancreatic juice and a small amount of this substance called enterokinase is capable of increasing the digestive activity of a large amount of the pancreatic juice. The experimental work of Opie, Coffey and others has demonstrated that fat necrosis occurs only when the pancreatic fluid escapes into and is confined in the retroperitoneal fat and that if it is delivered into the unbroken peritoneum fat necrosis does not occur, a fact borne out by Sistrunk in operating for pancreatic calculi. Sistrunk states that if sufficient provision is made for carrying off the pancreatic fluid to the surface no harm can result. Mayo says that the danger following acute processes of the pancreas depends upon whether infection co-exists or not and that infection plays the chief part

*Clinic, General Clinical Session, Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

*From the Gowdy Clinic.

in determining whether the patient will recover or not.

The formation of a pancreatic fistula following these injuries is not infrequent and the treatment and closure of these fistulae presents a difficult problem. Several methods for closure are advocated and much success has been attained by the use of the roentgen ray. Spontaneous closure is not the rule. Many cases are resistant to all forms of treatment, and the fistula continues to discharge its contents for many months.

The case to be presented here was difficult to diagnose and to treat. There was a spontaneous closure of the fistula.

CASE REPORT

N. M. L., age 19, was first seen on January 2, 1929, with a history of having been in an automobile accident thirty-six hours before. Immediately following the accident, which rendered him unconscious, he was seen by a physician who, on examination, found no evidence of abdominal injury, although the patient complained of pain in the abdomen and a bruised area was found in the upper abdomen. After a few hours the patient felt better and about twelve hours after the accident he got up and went to the bathroom, where he collapsed. About twenty-four hours after the accident the attending physician noticed that there were signs of intra-abdominal injury and hemorrhage and a consultation was called, at which time I saw him, about thirty-six hours after the accident. There was a marked rigidity of the entire abdomen, more pronounced in the upper part, considerable distention, a rapid pulse and other signs of hemorrhage. Immediate operation was decided upon and the patient was brought to Miami in an ambulance. He was prepared immediately for operation.

A right paramedian incision was made from the costal border to the umbilicus and the peritoneal cavity was opened. It was found to be filled with blood. There were no clots. The blood was removed and the abdomen explored for a bleeding point, which was found to be from a mesenteric vessel over the head of the pancreas. There was a tear in the mesentery at this point about the size of a quarter. This vessel was ligated and examination revealed no evidence of gross injury to the pancreas or other viscera. The condition of the patient was grave, the pulse being extremely rapid and weak and cardiac stimulants and intravenous saline were given while the abdomen was being closed. Two cigarette drains were placed in the wound down to the area over the pancreas, where the mesentery was found to be lacerated. Immediately after operation more normal saline was given by hyperdermoclysis, and four hours later a blood transfusion was done, 600 c. c. of blood being given by the direct method. The patient was extremely restless for two days following operation and became quite distended, vomited a great deal and was coughing and raising considerable mucus and mucopurulent material. The abdominal distention gradually increased and there was no return from enemas so that on January 6, 75 c. c. of 10 per cent saline and 50 c. c. of 50 per cent glucose were given intravenously, which was followed in about twenty minutes by a large liquid bowel movement and the lessening of the distention. The following day, four days after operation, the patient complained of pain over the base of the right lung and examination revealed friction rubs over this area. Up to this time there had been practically no drainage from the wound and when the drainage tubes were loosened and removed there still was no discharge from the wound. Abdominal examination at this time, however, revealed the presence of a large mass extending from the costal margin to about the level of the umbilicus on the right side, which was flat on percussion. That night while the patient was in a paroxysm of coughing there was a profuse discharge of sero-sanguinous fluid from the wound, but no decrease in the size of the mass. On January 11, eight days after operation, the wound commenced to drain a blood-tinged fluid which in a few days became very copious, then cleared up and was colorless. The pads of the dressing would become saturated in a few minutes, requiring constant changing. There was no evidence of irritation of the wound from the discharge. At this time tests were made on the fluid from the wound for digestive properties. No digestion was observed, and smears showed nothing but a few indistinct pus cells. Cultures showed *B. coli* and *S. Albus*. On January 23, the drainage decreased in amount and the wound tended to close, following which the patient vomited almost everything taken by mouth. The wound was opened with forceps and drainage was re-established. The condition of the patient became progressively worse, showing signs of an increasing obstruction until on February 4 it was decided to operate again to relieve the obstruction.

An incision was made to the right of the old wound over the area of greatest dullness and the fistula was followed down, revealing two large pockets of blood-stained material which were retroperitoneal and apparently in the lesser peritoneal cavity. Three cigarette drains were placed in the wound. The following day he was given 500 c. c. of blood by the direct method and this was repeated three days later. From that time on the condition of the patient improved and the discharge from the fistula decreased in amount. There was, however, following the second operation, a necrosis of fat and the edges of the wound were raw and inflamed and exceedingly painful. The skin margin around the wound was covered with vaseline strips to prevent further destructive action by the discharge from the fistula. Examination of the discharge at this time showed a diastatic activity (Winslow test). One c. c. completely digested 50,000 c. c. of 0.1 per cent solution of soluble starch in one-half hour. The necrosis became less and less, the skin around the wound became less inflamed and the fistulous tract decreased in size until at the time of discharge, March 13, there was a fistula about the size of a lead pencil discharging a moderate amount of clear colorless fluid. The general condition of the patient at the time of discharge was good. He had lost about 25 pounds in weight, but was gradually getting it back and there were no digestive disturbances. Following his discharge from the hospital, the patient returned to his home in the North. He says that the discharge decreased in amount until the fistula finally closed entirely on May 1. At the present time he is in good health, his appetite is good, and there is no evidence of permanent damage to the pancreas as shown by his digestion and sugar metabolism.

This case is presented because of the fact that when the discharge was first tested and on re-

peated trials no diastatic activity could be shown. Only after the second operation did evidence of fat necrosis develop. We feel that the second operation liberated tissue juices which contained some substance capable of activating the juice to its diastatic activity and producing the usual picture when pancreatic juice is liberated. Infection by the organisms present in the fluid shown on smear and culture may have been an important factor in bringing this about, since the fat necrosis is seen almost always in cases of hemorrhagic pancreatitis, and in these cases infection is usually present. The fact that the fistula closed spontaneously is also of interest because, as was said above, the number of cases of this kind in which the fistula has closed spontaneously is very small.

PELVIC ENDOMETRIOSIS: RELATIVE MERITS OF VARIOUS METHODS OF TREATMENT*

By CAYETANO PANETTIERE, M.D.,
Miami Beach, Fla.

It would be impossible to review the present status of the treatment of adenomyoma or endometriosis, without first presenting briefly the latest views on the morphology, physiology, invasive characteristics, tissue reaction, and transition stages of this condition. We find that most investigators are agreed as to what constitutes the microscopic picture of adenomyoma. The simplest form of this condition is that of island formation of uterine mucosa. The gland structures which vary in size, depending upon the menstrual cycle, are lined by a single layer of cuboid, high columnar epithelium, which is sometimes ciliated. The stroma surrounding the glandular structure is made up of large and small ovoid cells, whose processes form a delicate reticulum presenting the appearance of loose connective tissue and resembling the stroma of normal endometrium. Not uncommonly one finds fresh or old hemorrhages enclosed within these glandular structures. This arrangement forms what one might term a unit, and the size of the tumor is dependent upon the number of these structures found therein. Varying degrees of complexities are encountered, both as to extensiveness of the lesion and as to degenerative changes. Since these island enclosures have no outlet they readily undergo cystic degeneration, and these cysts contain the remnants of fresh blood, or, more commonly, old hemorrhages. The lining wall of the cysts varies from the high cylindrical epithelium in the smaller cysts to the flattened type in the larger or older cysts. Sampson describes as "endothelial leukocytes" the lining layer of large pigment-containing cells, and Schwarz-Crossen designates these as mononuclear migratory cells. The content of these cysts is usually that of blood pigment, cast-off epithelial and stroma cells, endothelial leukocytes and cholesterin crystals. When these cysts are broken a chocolate-colored fluid escapes; hence, they are often referred to as "the chocolate cysts of Sampson." A further step in the degenerative process of this disease is its transition into malignancy of the adeno-carcinomatous type.

Endometriosis as described above has been found in the female genital tract from the vulva to the ovaries, including the labia, recto-genital space, corpus, tubes, utero-sacral, utero-ovarian and round ligaments; and extra-genitally in the appendix, the small intestine, the colon, the recti muscles, the umbilicus, laparotomy scars, urinary bladder, the liver and gall bladder.

The physiology of adenomyoma is as striking as is its morphology. These islands of misplaced endometrial tissue, wherever found, undergo the same physiological changes as does normal endometrium at the time of menstruation. It would seem that, like the normal endometrium, they are dependent upon the stimulus of the ovarian hormone for their activity; and conversely, these islands undergo the same atrophic and regressive changes as does the normal endometrium when deprived of the stimulation of the ovarian hormone. While this is a rule, it is not unfailing. Cullen described a case in which the tumor continued to develop two years after a bilateral oophorectomy had been performed upon the patient.

While most workers are agreed as to the morphology and physiology of misplaced endometrial tissue, there is great disagreement as to the origin and dissemination of these cells. Since the first description by von Recklinghausen in 1893, when he suggested the embryonic theory of the origin of these cells, to the present time, many views on the subject have been advanced. Von Recklinghausen suggested that they might arise from embryonic remains derived from the

*Clinic, General Clinical Session, Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

Wolffian body; and fragments of the Wolffian body have been described near the site of the inguinal canal in the embryo. Following this line of thought, Cullen suggested the possibility that remnants of Mueller's ducts were the source. But as early as 1897 he presented his displacement theory, that adenomyoma was resultant upon invasion of the uterine wall by its mucous membrane. Lockyer, in 1918, believed the vagina or peritoneum to be the source of the epithelium found in cases of adenomyoma of the recto-vaginal septum. Sampson is the exponent of the implantation theory; he believes that endometrial transplants escaping from the open ends of the Fallopian tubes form the source of these islands. Meyer expresses the belief that the presence of misplaced endometrial tissue is due to an inflammatory reaction. While each of these theories has its followers, and many exemplary cases can be mentioned to substantiate these views, no one theory seems to be adaptable to all cases. The inclusion theory of Cullen is particularly well adapted to adenomyoma of the corpus, and so far the implantation theory of Sampson explains rather convincingly the presence of adenomyoma in distant places, such as laparotomy scars following operations, or vulval endometriomas following instrumental deliveries. The dissemination of these cells is equally perplexing. Sampson expressed a belief that metastases may occur by way of the veins, as shown by his injection experiments, while Schindler and Halban believe that dissemination takes place through the lymphatic route. In two reported cases regional lymph nodes were involved.

In consideration of the pathology encountered, it will be evident that the method of treatment of pelvic endometriosis will depend largely upon the size of the tumor and its degree of invasion of the pelvic structures. Small discreet tumors of the vulva, vaginal wall, laparotomy scars, or elsewhere should be completely excised. This is particularly advisable for tumors in the posterior vaginal wall, whether they are free or adherent to the cervix, or in accessible areas such as the vulva, umbilicus or abdominal wall. The diffuse adenomyoma of the corpus requires hysterectomy. Further involvement requires more extensive operative procedures to the extent that in some cases of advanced adenomyoma of the recto-vaginal septum, with obstructive symptoms, preliminary colostomy may be necessary prior to the complete removal of the growth and pelvic organs. The tendency to fibrous reaction is maximal and often a great deal of time has to be spent in separating the adjacent structures, such as ureters, bladder and bowels. Occasionally one encounters endometriomata of the recto-vaginal septum which involve not only the cervix, vagina and rectum, but invade the broad ligaments, surround and constrict the ureters, with resultant hydro-ureters and hydronephrosis, infiltrate large areas of the rectum, narrow its lumen, and finally cement together the pelvic structures into an immovable mass, considerably resembling the picture encountered in massive chronic pelvic cellulitis. The treatment of this tremendous involvement has so far resolved itself into an extensive surgical procedure, requiring careful dissection and often a resection of the rectum, sigmoid and bladder. The literature is sadly deficient in records regarding the use of radium in adenomyoma. Burnam and Heineberg each report very satisfactory results with the use of radium in a few cases. Heineberg states that from the results obtained it would seem that there is a distinct field for the use of radium in the treatment of adenomyoma, particularly of the recto-vaginal septum. He refers particularly to

> "those instances in which the tumor is not small enough to be easily removed through a vaginal incision, and not so large that all of it cannot be brought under the influence of the radium embedded within it."

In a review of the literature, one is impressed with the fact that the best results have been obtained by surgical removal of the tissues affected, that x-ray and radium offer excellent assistance in recurrent cases, that radium might be used as the sole medium of attack in selected cases, that the x-ray functions by its attack upon the ovaries and probable arrest of tumor growth. In those cases where malignancy is encountered in conjunction with adenomyoma the attack must be the same as that for malignancy. Lastly, we must remember that endometriomata are dependent upon ovarian activity for their growth and dissemination, and this fact must be borne in mind when we are deciding upon the method of attack.

"MALIGNANT HYPERTENSION," A CRITIQUE, WITH REMARKS ON THE NATURE OF HYPERTENSION*

By WALLACE M. YATER, M.D.,
Washington, D. C.

Hypertension ranks with tuberculosis, syphilis and cancer as a problem of modern medical science. Its incidence is apparently increasing, and the toll it takes annually in lives is becoming more and more distressing. Its cause, like that of cancer, is entirely unknown. Formerly it was thought that most hypertension was due to nephritis, but now it is known that the majority of cases fall in the class designated primary or essential hypertension.

Latterly certain prominent medical men have been dividing essential hypertension into two types: benign and malignant. A distinction pathologically between the two types has never been established by those who affirm the classification. Nevertheless there is undoubtedly a clinical form of essential hypertension which from the standpoint of prognosis is malignant at the time the diagnosis is made as distinguished from that form which is usually encountered and which runs a relatively benign course. That the latter form may rather suddenly take on the characteristics of the "malignant" variety seems also certain. These characteristics as depicted by Wagener and Keith (the original describers of the syndrome) are very high and fairly stable systolic and diastolic blood pressures, general visceral failure with or without severe renal insufficiency, the presence of a type of retinitis resembling so-called albuminuric retinitis, but associated with retinal arteriosclerosis, and a rapidly fatal course. Pathologically there is cardiac hypertrophy, the degree of which depends upon the duration, height and constancy of the hypertension, and thickening of the walls of the arterioles with reduction of the diameter of the lumina especially marked in the kidneys and present also in many other organs and tissues. These lesions, however, are found in all cases of persistent hypertension.

The experience of Keith, Wagener and Kernohan leads them to consider the hypertension primary and the changes in the arterioles secondary. They believe that so much evidence of hypertrophy of the arterioles suggests hypertrophy in the face of excessive strain. This conception is applicable to all cases of essential hypertension. In other words, a vasospastic diathesis exists which ultimately leads to hypertrophy of the media of the arterioles and finally to permanent vasoconstriction. The permanent reduction of the arteriolar bed of various viscera causes impairment of function of the viscera. If the heart wears out first from the strain of compensating for the generalized vasoconstriction death occurs from cardiac fatigue. When the cerebral arterioles are disproportionately affected death may result from cerebral softening, due to ischemia, thrombosis or hemorrhage. When the renal arterioles are so generally reduced in calibre of their lumina that extensive ischemia of the renal parenchyma results before cardiac or cerebral dysfunction becomes excessive, renal insufficiency constitutes the essential cause of death. In many instances combinations of these modes of failure exist and in some cases all apparently progress at the same rate. In the latter the vascular constriction is so great and so constant that partial cardiac, cerebral and renal failure combine to cause a fatal termination before the involvement of any one organ is in itself sufficient to constitute a simple modus operandi of death. It is conceivable that if the arteriolar hypertrophy and constriction has been more than usually generalized and severe, a relatively slight increase in degree of functional deficiency of one of the three main viscera, heart, cerebrum or kidneys, might be sufficient to precipitate a general visceral failure. This state would then give the clinical picture of "malignant hypertension." For example, if the viscera are already compromised functionally by a greatly diminished vascular bed and their reserve is encroached upon, a slight additional lowering of cardiac function would so further impair the function of all of the other viscera that a general failure would result.

The conception of essential hypertension as originally a vasospastic state has much to commend it. The fluctuating character of the hypertension in the early stages of the condition, the later appearance of hypertrophy of the muscular coat of the arterioles with greater stabilization of the hypertension, and the absence of evidence of inflammation are facts supporting the theory. The cause of the original vasospastic condition remains unsettled. Whether it is due to stimulation of the endings of the sympathetic nerves by pressor substances cir-

*From the Georgetown University School of Medicine.
*Read before the Medical Society of the District of Columbia November 27, 1929.
*Received for publication December 18, 1929.

culating in the blood, to the direct effect of such substances on the musculature of the arterioles or to some more general disturbance of the sympathetic nervous system is a problem difficult of solution. It is even possible that exophthalmic goitre and essential hypertension have something in common as regards etiology.

There is one argument in favor of the theory of the vasoconstriction origin of the hypertension which I have never heard expounded. That the arteriolar hypertrophy is widespread has been definitely established. Kernohan, Anderson and Keith have shown that even the arterioles of the skin and voluntary muscles are involved. There are, however, two organs in which the muscular hypertrophy of the arterioles is minimal, that is, the heart and the lungs. The relative absence of hypertrophy of the media of the coronary arterioles was pointed out to the author by Dr. H. E. Robertson. A study of the arterioles of the heart of many individuals who had died from the effects of hypertension bore out this statement. Likewise a similar study of the lungs revealed the absence of involvement of the arterioles there, although in rare instances hypertrophy of the arterioles of the lesser circulation may occur, as shown by Yater and Constam. Such a condition, however, is independent of systemic hypertension and is probably due to hypertension of the pulmonary circulation. The arterioles of the heart and lungs may be and probably are subject to a certain amount of vasomotor control, but this control is probably only sufficient to prevent excessive dilatation. It is inconceivable that the heart and lungs, organs which are above all others so essential to immediate existence, should be subject to the same sudden diminution of their blood supply by arteriolar constriction as other viscera not so immediately essential to life. The great cardiac hypertrophy which necessarily occurs in the presence of continuous hypertension would also be impossible if the coronary arterioles took part in the change observed in the arterioles of other viscera. The fact, then, that the arterioles of the heart and lungs, whose subjection to vasomotor control is undoubtedly slight, escape in great measure the process of hypertrophy of their musculature which occurs elsewhere is additional evidence in support of the vasoconstriction theory of essential hypertension. The following report of a case of "malignant hypertension" is given to illustrate the points of discussion.

CASE REPORT

The patient, an Irish laborer aged forty-three years, entered Georgetown University Hospital on March 8, 1929, complaining of progressively increasing weakness, dyspnea and cardiac consciousness of only one month's duration. At the onset the systolic blood pressure had been found to be 250. Moderate nocturia had developed during the month. The only illness of note in the past history was scarlet fever at ten years of age. The family history was irrelevent.

Examination revealed a well developed man, looking very ill, with Cheyne-Stokes respiration. The heart was beating regularly and rapidly at the rate of 120 beats per minute. The heart was enlarged to the left, the apex beat being 12.5 cm. to the left of the midsternal line; the latter was forceful but well localized. Gallop rhythm was audible, the extra sound being presystolic and there was a systolic murmur at the apex. The second aortic sound was not particularly accentuated. There were a few crackling inspiratory rales at the lung bases. The liver was not palpable and there was no evidence of ascites. There was a trace of pretibial edema. The peripheral blood vessels were somewhat thickened but were compressible and not tortuous. The blood pressure was 225 systolic and 160 diastolic. The ocular fundi showed the retinitis of "malignant hypertension," with blurring of the disk margins, sclerosis of the retinal arteries of the hypertension type, a few hemorrhages and evidence of an old thrombosis of the left inferior temporal artery.

Laboratory examinations were reported as follows: urine acid, specific gravity 1.020, marked albumin, numerous hyaline casts, a few granular casts and an occasional red blood cell and leucocyte. Hemoglobin was 78 per cent by the Dare method, erythrocytes 3,290,000 and leucocytes 9,860 per cu.m. of blood. Blood non protein nitrogen was 85 mg. and creatinine 2 mg. per 100 c. c. of blood. Blood Wassermann and Kahn tests were negative. There was a return of 29 per cent of phenolsulphonephthalein in the urine in two hours. There was evidence of passive congestion of the lungs and cardiac hypertrophy in a roentgenogram of the chest, and the auricular diameter of the heart of 14 cm. and total transverse diameter of the heart of 20 cm.; transverse thoracic diameter 30 cm. Electrocardiogram showed a few auricular premature contractions, diphasic T wave in all leads and some slurring of the QRS complex in leads 1 and 2.

Soon after admission, 500 c. c. of blood were withdrawn from a vein. Morphine hypodermically was ordered as needed for orthopnea and cardiac oppression, and erythrol tetranitrate was given in doses of 0.065 gm. (one grain) every two hours during the day. Six ounces of milk or orange juice were given every two hours with six ounces of water between these feedings. After three days the diet was changed to a salt-poor one containing 1,500 calories and 40 grams of protein with 2,500 c. c. of fluid in the 24 hours. Later the caloric content was increased to 1,800. After six days the erythrol tetranitrate was reduced to 0.065 gm. (one grain) every four hours, and six days later the drug was discontinued. On the fifth day acute retention of urine occurred and because catheterization had to be resorted to repeatedly, a permanent catheter was inserted. After two weeks a severe urethritis developed, and two weeks later a painful swelling of the left testicle was noted. The latter developed into a hydrocele. Finally voluntary micturition returned and the catheter was withdrawn. The urethritis gradually subsided.

For the first few days in hospital the patient continued in about the same condition as on admission, but on the fifth day respiration became regular, the heart rate began to slow down and the blood pressure, both systolic and diastolic, to fall. The appetite also began to return. The blood pressure continued to fall, until by the end of four weeks it was 140 systolic and 80 diastolic. The heart rate gradually became normal and the gallop rhythm and systolic murmur disappeared. On April first the patient was allowed out of bed for a brief period, and the length of the period was gradually increased from that time on. On March 20, examination of the ocular fundi revealed the presence of exudates in both retinae and incomplete macular stars. The casts and erythrocytes in the urine gradually disappeared. The renal function test on April 20 gave a return of 45 per cent of phenolsulphonephthalein in two hours. The blood non protein nitrogen on this date was 41 mg. and the blood creatinine 1.5 mg. per 100 c. c. of blood. The urinary output at all times was good. On April 9 the blood pressure suddenly rose to 220 systolic and 110 diastolic. This change coincided with the occurrence of the acute testicular swelling. From this time on, however, the blood pressure remained moderately high, and on discharge from the hospital it was 212 systolic and 118 diastolic. The heart rate continued normal and respiration regular. When the patient left the hospital he was feeling fairly well, although still weak.

From May 6 until August 10 the patient was occasionally seen in the outpatient department. His condition during this time remained about as it was at the time of his discharge from the hospital. The systolic apical murmur returned and there was dyspnea on exertion and nocturia. On August 10, the patient re-entered the hospital complaining of orthopnea and some swelling of the feet and hands. He appeared very ill and was in much the same condition as upon his first admission. The ocular fundi were free of exudates and had exactly the same appearance as when first studied in March. The laboratory findings were almost identical with those obtained at that time, except that there was more blood in the urine and he was slightly more anemic. This time, however, the course was gradually downhill. The patient's appearance became cadaveric, there was profuse perspiration and marked weakness, and severe acute attacks of collapse occurred. The urinary output remained fair throughout, but toward the end the edema of the legs increased somewhat. The blood pressure continued high. Five days before death the non protein nitrogen was 64 mg. and the creatinine 2 mg. per 100 c. c. of blood. For days the patient appeared as if dying. Finally intravenous injections of 50 c. c. of 50 per cent glucose were resorted to. On September 3, death occurred.

Necropsy revealed the presence of a terminal right fibrinous pleuritis with 500 c. c. of flaky fluid in the right thoracic cavity. The lower lobes of both lungs showed severe congestion and edema. The heart was very large, weighing 680 grams. The hypertrophy affected mainly the left ventricle, which was moderately dilated. The muscle was firm and showed no evidence of fibrosis or fatty degeneration. The endocardium and valves appeared normal, and the coronary arteries showed slight atheromatosis. The liver was slightly enlarged and showed passive congestion on cut section. The kidneys were of normal size, the capsules stripped easily and the surface was finely granular. Except for evidence of congestion the cut sections appeared normal. The aorta was moderately sclerosed. The brain was not examined. In the histologic examination special attention was paid to the heart, kidneys and the arterioles of the viscera. The heart muscle fibers were slightly hypertrophied, but appeared normal; there was no notable increase in amount of connective tissue, and the arterioles and capillaries showed no degenerative or hypertrophic changes. Sections of the kidneys showed marked congestion. The walls of the smaller arteries and arterioles were thickened and the ratio of wall to lumen was increased. There was medial hypertrophy and subintimal thickening and degeneration with hyaline, fibrinoid change. The glomeruli in general were well preserved, with a scattering of completely fibrosed glomeruli and beginning lobulation of the tufts in others. Occasionally Bowman's capsule was found to be slightly thickened. The connective tissue was only slightly increased in amount. There was no evidence of glomerular nephritis. The arteriolar walls of the spleen, pancreas and adrenals were thickened, the thickening due largely to medial hypertrophy. The liver showed subacute passive congestion. The lungs were markedly edematous and engorged, but the walls of the arterioles were not thickened.

COMMENT

This case is typical of the syndrome of "malignant hypertension" as described by Wagener and Keith, except that the blood pressure fell practically to normal during the patient's first stay in the hospital, only to rise suddenly and remain high even though the patient continued to improve. As a rule, the hypertension is permanently high, although Keith has diagnosed some cases as "malignant hypertension" when the blood pressure was only moderately elevated. The behavior of the blood pressure in the case reported is difficult to explain. It is true that in cases of hypertension the blood pressure may diminish somewhat as cardiac efficiency improves with treatment, immediately following severe cardiac decompensation. On the other hand, in some cases with persistently impaired cardiac function (improperly called chronic myocarditis) the blood pressure has returned to normal and remained so. In most cases, however, the blood pressure remains high even when severe cardiac decompensation exists.

The history in this instance shows that only eight and one-half months passed between the onset of symptoms with discovery of the hypertension and the death of the patient. Undoubtedly the hypertension had existed for a considerable length of time, as indicated by the large size of the heart at the time the breakdown began. Apparently the onset of cardiac insufficiency precipitated a general visceral failure. The patient can not be said to have died of failure of any one organ. Pathologically there was

no difference between this case and any other case of persistent essential hypertension.

There are, then, certain cases of essential hypertension in which the vasoconstriction is so generalized and so severe that general visceral failure occurs before any one organ completely fails. This state gives the clinical picture of "malignant hypertension." A change of nomenclature is urgently needed, adapted to the present state of our knowledge of hypertension. Every case of hypertension is potentially malignant. The patient will die from the effects of hypertension if he does not succumb to some other disease earlier. The term benign hypertension should, therefore, be abandoned. From the standpoint of prognosis the clinical syndrome now designated malignant hypertension must be recognized, although the name need not be used. One might designate a case of essential hypertension after failure has begun as of the cardiac form, cerebral form, renal form, combined form, or general visceral form. The designation would then indicate the manner of failure. The combined form is one in which there is evidence of significant insufficiency of more than one of the three main organs involved in hypertension. The general visceral form refers to that designated now by some as malignant hypertension and in which death may occur without the degree of failure of any one organ being in itself sufficient to cause death.

SUMMARY

The syndrome described and designated by Wagener and Keith as malignant hypertension must be recognized, mainly because of its prognostic significance. The syndrome is, however, merely a severe form of essential hypertension in which the arteriolar changes are so generalized and severe that general visceral failure occurs before the failure of any one organ is sufficient to account for death. All cases of essential hypertension are potentially malignant, in that death will occur from the effects of hypertension if the patient does not succumb to some other pathological condition earlier. The terms benign and malignant as applied to essential hypertension should, therefore, be abandoned. Cases of hypertension may better be designated as of cardiac form, cerebral form, renal form, combined form or general visceral form according to the manner of failure.

Additional arguments are given for a more or less generalized arteriolar spasm as the cause of essential hypertension.

REFERENCES

Wagener, H. P.; and Keith, N. H.: Cases of Marked Hypertension, Adequate Renal Function and Neuroretinitis. Arch. Int. Med., 34:374, 1924.

Keith, N. H.; Wagener, H. P.; and Kernohan, J. W.: The Syndrome of Malignant Hypertension. Arch. Int. Med., 41:141-188, 1928.

Kernohan, J. W.; Anderson, E. W.; and Keith, N. M.: The Arterioles in Case of Hypertension. Arch. Int. Med., 44:395-424, September, 1929.

Yater, W. M.; and Constam, G. R.: Pulmonary Arteriosclerosis. Med. Clin. of N. A., Mayo Clinic Number, 12:1689-1700, May, 1929.

SYMPOSIUM ON MALARIA

RECENT DEVELOPMENTS IN THE CONTROL OF MALARIA*

By W. E. DEEKS, M.D.,†
New York, N. Y.

The importance of preventing anopheline mosquito-breeding, in order to control malaria, has long been appreciated; and it was practically demonstrated in Panama during and subsequent to the period of the construction of the Canal. At that time, however, the importance and practicability of treating cases of malaria in the homes and labor camps were not recognized. Many of the laborers remained for days in their homes or camps, suffering from fever, until they developed grave conditions which brought them to the attention of the sanitary officers, who sent them to the hospitals. In the medical wards of Ancon Hospital it was not unusual to admit in a single day one hundred or more cases of acute malaria from the laboring population alone. During the rainy season the available beds were constantly filled with patients; and frequently many had to be placed on the floors, which were occasionally so crowded that the physicians had to step over them in making the rounds.

In the early days of the construction of the Canal, malaria cases remained in the hospital under treatment for three or four days only, or until the fever and acute symptoms subsided, when they were discharged and returned to duty. Many of them relapsed even before they reached camp, and were hospitalized again for further treatment.

The writer was impressed with the poor physical condition of many of the patients, who were anemic from chronic malaria, malnutrition, syphilis or hookworm infestation, and therefore offered little resistance to infections of different kinds. It was consequently decided to detain them in the hospital under treatment and on a nutritious diet until they showed at least five days of continuous normal temperature and their general physical condition was improved. In addition to the administration of quinine, their detention enabled us to give one or two hookworm treatments before they were discharged, and also to initiate treatment for complicating constitutional conditions. At that time the routine treatment for malaria consisted of 30 grains of quinine daily, usually in three doses. Calomel was administered on admission and a dose of magnesium sulphate was given a few hours later. The first hookworm treatment was given when the fever had subsided, and in severe cases of infestation the treatment was repeated within a few days. Generous diets were provided as soon as their appetites returned. It was soon apparent that these measures improved the physical condition of the patients and thereby prevented relapses, and the procedure was put in effect as a routine method in all the hospitals on the Zone.

It did not occur to the clinicians at that time to re-examine the blood of patients for malaria parasites when they were discharged. Had this been done we should probably have found that many of them were reservoirs of prolific gametocyte infection, and returned to the camps under ideal conditions to infect mosquitoes and spread the disease.

During the summer of 1926, Dr. H. C. Clark, in making blood surveys in the plantations of the United Fruit Company, observed in the blood of patients convalescent from acute attacks that though the schizonts had disappeared from the peripheral blood, in some cases the gametocytes were far more numerous than before treatment was given; and that the incidence of rich gametocyte infection was greater in the hospital-treated cases than in those from the camps, to whom little or no treatment had been given. Naturally, most of the cases sent to the hospital were suffering from acute attacks. These observations have been confirmed by other members of our staff. In order to account for this condition, it must be realized that the fever incidental to malaria infection is due to the toxin liberated at the time of sporulation, and the greater the number of parasites sporulating at the same time the more toxin is liberated; and, naturally, it can be inferred that a high fever indicates prolific sporulation. Sporulation of

*President's Address, American Society of Tropical Medicine (meeting conjointly with Southern Medical Association), Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†General Manager, Medical Department, United Fruit Company.

parasites is not always synchronized; and some lag, while others anticipate the mass production.

Some of the merozoites which are liberated develop into gametocytes or sexual forms. Their relative number, as compared to the number of those that develop asexually, is unknown. It can be inferred, however, that the greater the number of sporulating parasites, the larger will be the number that will develop into gametocytes. This accounts for the large number of crescents present in the peripheral blood after acute febrile attacks, as observed by Dr. Clark and others who were dealing largely with the estivo-autumnal type of malaria. Through the agency of quinine and its salts the schizonts are destroyed, but the gametocytes or crescents apparently are not. Furthermore, quinine does not apparently interfere with the intracorpuscular development of the gametocytes; but it automatically prevents their further production by destroying the schizonts. The consensus of opinion is that gametocytes do not cause symptoms *per se*, with the possible exception of assisting in the blocking of capillaries in the course of an acute exacerbation of the disease when toxin is freely liberated. This causes irritation of the capillary endothelial cells; and is accompanied by exudation which narrows the lumen of the vessels and interferes with the passage of the red and other cells in the blood, including the parasites. That cell irritation and destruction occur during acute attacks of malaria is shown by the frequent presence of temporary albuminuria, as well as by the liver and splenic enlargement and the development of icterus.

Only those gametocytes, and they are few in number, that are opportunely sucked up by a mosquito ever fulfill the function for which they are intended. The vast majority of those which are developed remain in the blood and eventually die and are phagocyted like all other dead cells. It is another example of Nature's method of prolific sex-cell reproduction in order to perpetuate the species. A tapeworm during its life may produce 80,000,000 eggs, but the hazards of survival are so great that only an occasional egg completes the life cycle and reproduces its kind. It is only through the gametocytes withdrawn by mosquitoes that malaria can be transmitted and the species perpetuated.

We have only one known agent for the destruction of the asexual forms of malaria parasites; and that is quinine and its salts. This is thoroughly effective, if given in sufficient dosage and over a sufficiently long period. If quinine be given in proper dosage, when the earliest manifestation of symptoms appear at the onset of a primary attack, a cure may be expected within a few days; and few or no crescents will have time to develop, as they require probably twice as long as the schizonts to reach maturity. If treatment be delayed until several sporulations have occurred, gametocytes develop in large numbers; and under such conditions the patients are prone to become highly infective to mosquitoes. In chronic cases the defensive agents of the body are able to control, but not eradicate, the parasites; and gametocytes continue to develop in small numbers. Under these conditions, the infected individuals are not highly infective to mosquitoes; but during a relapse, when the patient's resistance is lowered from any cause such as fatigue, exposure to wet or cold, an injury, or intercurrent diseases, and there is a recrudescence of fever indicating many sporulating parasites, the patients become more infective to mosquitoes.

In every malarial community a thick-film blood survey will disclose that a certain percentage of the population is carrying parasites, which will vary in number in different individuals and in the same individual at different times. In a single survey the positive cases which are discoverable by the blood examinations represent probably not more than one-half of the number infected, as surveys on successive days reveal. Many of the chronic cases are apparently well, free from symptoms, and capable of performing their daily tasks. They may show few or no gametocytes in the small amount of blood examined, and consequently are not highly infective to mosquitoes; and only during a relapse will the sexual forms develop in sufficiently large numbers to be a menace to the community. It is the cases of frank relapse and acute primary infection that must be controlled if we are to prevent prolific gametocyte development; and this can be effectually done by the prompt administration of quinine, in adequate dosage, at the onset of acute symptoms.

The observations made on our plantations by Dr. H. C. Clark, Dr. M. A. Barber and Mr. W. H. W. Komp, Dr. W. Cordes, Dr. E. R. Whitmore and others, leave little room for doubt that quinine has no effect on the developmental or mature stages of the gametocytes, nor does it interfere with their infectiveness to mosquitoes. This statement applies particularly to the estivo-

autumnal parasites. We have not yet had sufficient opportunity to form a definite opinion as to its effects on these stages of the parasites in cases of the benign forms of malaria. When the schizonts are destroyed and their proliferation prevented with quinine, no new gametocytes can be produced, as their source of production no longer exists. That quinine does not devitalize the gametocytes to such a degree as to prevent mosquito infection has been repeatedly demonstrated in our plantation work. Mosquitoes fed on patients with rich crescent infection, during and following the administration of quinine, generally develop a large number of oocysts which mature and render the mosquitoes infective.

The effects of plasmochin on the crescents, however, is a different story, as it does what quinine and its salts fail to do. It devitalizes the gametocytes, so that patients who have received a sufficient dosage of this drug are not infective to mosquitoes. This property which plasmochin possesses makes the discovery of the drug one of the greatest advances in recent years in malaria control.

When plasmochin was first used in our plantations in 1926, generally in combination with quinine, it was considered necessary to give it in doses of from six to eight centigrams daily for five or six days. Treatment was suspended for a few days, and the course was then repeated. In this dosage toxic symptoms were frequently observed, and an occasional death occurred. At that time we expressed the opinion that its usefulness was limited, as it was believed that it could be safely administered only to hospital patients under direct medical supervision. However, after considerable experimentation in our hospitals, it was determined that a much smaller dosage would accomplish the same results and would not produce toxicity. Dr. O. T. Brosius initiated this line of research; and the benefits derived from his investigations are obvious, as he was able to demonstrate conclusively that it could be used safely and efficiently in field and dispensary work. This materially extended the scope of usefulness of the drug.

The next advance in our knowledge concerning the utilization of plasmochin was the result of the research work done by Dr. M. A. Barber and Mr. W. H. W. Komp, of the United States Public Health Service, in our Panama Division during January and February, 1928. They demonstrated that mosquitoes fed on quinine-treated cases which were carrying numerous gametocytes invariably developed large numbers of oocysts in their stomachs; but that no oocysts could be found in mosquitoes fed on the same patients after they had taken one compound tablet containing 1 centigram of plasmochin and 0.125 grams of quinine, despite the fact that they were still carrying an equally large number of gametocytes. In one case one-half a tablet proved efficacious. The work was repeated by them in the early months of 1929 in a few suitable cases (that is, with rich crescent infections); and the results were equally satisfactory. This work was of such importance and significance that Dr. Eugene R. Whitmore, of Georgetown University, Washington, D. C., proceeded to Puerto Castilla, Honduras, with the object of undertaking experimental work along the same lines as those followed by Barber and Komp. He found that the administration of 1 centigram of plasmochin to Honduranian laborers did not always prevent oocysts from developing in the stomachs of the mosquitoes, but that they were few in number when compared to those which developed in mosquitoes fed on patients who had not been given plasmochin. Furthermore, a single dose of 2 centigrams of plasmochin proved successful in all the cases treated, and in no instance did the mosquitoes fed on patients for seven successive days thereafter develop an oocyst. These results appear conclusive; and, if further confirmed, plasmochin will become an almost indispensable agent in effective malaria control.

In the plantations of the United Fruit Company, which for the most part are located in highly malarial districts and inhabited by people who will not take advantage of the protection afforded by screened quarters even when they are provided, we began a malaria-control campaign towards the end of 1926. A single thick-film survey showed an average infection rate of more than 40 per cent in most of the divisions, which meant that probably 80 per cent of the laboring population were carrying parasites.

The malaria-control program included:

First, short radius mosquito-breeding control by the recognized sanitary measures, drainage, filling, or larvicidal treatment of all water surfaces within one hundred to three hundred yards of all dwellings.

Second, repeated thick-film blood surveys in order to determine the incidence of infection and to obtain progress reports.

HOSPITAL ADMISSION RATE FOR MALARIA (PRIMARY DIAGNOSES ONLY)*
Per Thousand Employees Per Annum

Year	Colombia Division	Costa Rica Division	Guatemala Division	Panama Division	Tela Railroad	Truxillo Railroad	Banes Division	Preston Division	Total
1925	90.78	161.97	287.72	260.93	172.00	261.13	630.92	282.02	254.37
1926	69.26	254.97	286.81	160.50	133.22	188.74	535.32	169.49	222.85
1927	36.63	249.99	205.06	107.73	179.23	195.51	154.50	124.21	150.97
1928	64.40	162.49	146.19	124.28	112.80	172.63	62.25	44.45	106.59
1929	96.76	100.62	100.64	75.55	116.09	166.45	36.71	19.73	84.69

*The first nine months of each year, January to September, inclusive, have been used, as the figures for the last three months of 1929 were not yet available when this table was compiled. But the figures given show the rate per thousand per annum for the periods covered.

Third, frequent visits (daily, wherever possible) to the homes and camps with the object of discovering the sick and treating them immediately. Patients giving a history of recurring chills and fever were given a sufficient quantity of quinine and plasmochin to provide a complete course of treatment, and were definitely instructed as to how the drugs should be taken. It is believed that, if patients are treated in their homes and camps in the early stage of a relapse or a primary infection, few gametocytes develop; whereas, if they are allowed to remain untreated in camp for several days, they become reservoirs of rich gametocyte infection. The persons who are seriously ill are referred to the dispensaries or hospitals.

Fourth, an educational campaign among all the intelligent units directly in charge of labor, with the object of informing them of our methods and soliciting their cooperation in the care of their laborers.

At first many difficulties were encountered. The areas to be sanitated were vast; there were many "doubting Thomases" among the members of our personnel; and there was a spirit of suspicion and distrust among the laborers and their families. However, the work was energetically pursued; cooperation was gradually obtained; the laborers were convinced of the benefits derived from early treatment; and these measures soon began to show results. The efficiency of the laboring population was increased; and consequently their earning capacity enhanced. This resulted in their becoming more contented, as they felt better and with increased earnings were able to improve their standards of living. This was reflected in lower production costs, which convinced the administration officials that the efforts and extra expenditures incurred in connection with the campaign had been justified. The intensive anti-malarial campaign was started in the latter months of 1926, and the following table, which shows the hospital admission rate for malaria per thousand employees per annum, gives a fair conception of the success of the campaign in the various divisions:

For a variety of reasons, better results have been obtained in some divisions than in others. These differences are due in part to the dissimilarity in meteorological and topographical conditions in the various localities, and in part to better cooperation in some divisions than in others.

The conclusion is inevitable that it is financially profitable for industrial organizations in the American Tropics to sanitate the areas where they operate and to look after the welfare of their laborers.

THE ADMINISTRATION OF QUININE BY RECTUM IN THE TREATMENT OF MALARIA*

By K. P. A. Taylor, M.D.,†
Quirigua, Guatemala

Difficulty in the oral administration of quinine is encountered in the following case types:

(1) Those who object to the disagreeably bitter taste experienced when 30 or more grains are taken daily over a period of several days. This taste is particularly noticeable in the early morning, and renders food unpalatable.

(2) Those whose gastro-intestinal tracts are unusually sensitive to quinine. In some individuals of this group, irritation of the mucosa is

*Received for publication March 21, 1930.
†United Fruit Company Hospital.

so severe that vomiting and even hematemesis, are produced.

(3) Those who are nauseated or vomiting from the true gastro-intestinal form of malaria. In the American tropics, this group is of the greatest importance and the most frequent in incidence.

(4) Unconscious patients, usually suffering from the algid and cerebral types of malaria.

(5) Individuals who are too ignorant, indolent, or prejudiced to persist long enough in the oral administration of quinine.

Intravenous and Intramuscular Injection of Quinine.—The dangers and disadvantages of these routes of administration are too well known to warrant discussion. Maxcy[1] in a report collaborating with the special committee of the Council of Pharmacy and Chemistry of the American Medical Association[2] has supported the view that the therapeutic action of quinine in malaria results not from direct contact of the drug with malaria plasmodia, but rather through the medium of a metabolite, formed by quinine decomposition or alteration in the liver and capillaries. This committee confines its indications for the use of quinine intravenously to gastro-intestinal forms of malaria and to cerebral types. The necrotizing action of quinine alkaloids and salts upon tissue has been fully discussed by Dudgeon[3] and Fletcher.[4] Abscess formation, necrosis, severe secondary hemorrhage, fatal septicemia and sciatic nerve paralysis have been observed by the writer to follow intramuscular gluteal injection of quinine, and should relegate this mode of application to the most severe infections, vomiting cases, and unconscious and convulsive forms. Unfortunately, a large proportion of malaria cases applying for treatment in tropical America are of such severity that parenteral administration of quinine must be carried out, at least as an initial measure.

Quinine by Rectum.—A test of the rectal administration of quinine was decided upon in the hope of finding a therapeutic method which would make unnecessary intravenous or intramuscular quinine injection in vomiting patients and cerebral types. Caution in selecting cases has not yet permitted a trial of the method in these case groups. The excellent results obtained in treating a small series (eleven) of mild and moderately severe cases of malaria by the rectal instillation of quinine, would seem to justify extending the trial of the method to more unfavorable cases.

Past Experience.—In the past many attempts have been made to effect routine rectal quinine administration; but the method has found little favor because of the resulting burning, irritation, tenesmus and diarrhea and uncertainty as to the quantity of the drug absorbed.

Wilcox,[5] quoted by Ross,[6] has estimated (clinically) that quinine administered by rectum is only half as effective as when given by mouth, and that both of these methods are inferior in point of effectiveness to the intramuscular and intravenous routes. Suzuki,[7] on the other hand, reported that the minimal lethal dose of quinine administered by rectum to rabbits was 0.33 gram per kilogram, while by mouth it was 0.66 gram per kilogram. He habitually uses the rectal route in clinical practice, administering daily 100 c. c. of a 0.5 per cent solution of quinine hydrochloride in water. The results reported by Suzuki from this small dose (0.5 gram) given daily by rectum, made a favorable comparison with cases treated by mouth. Generally speaking, they caused no "uncomfortable local disturbances."

It is clear that so small a daily dosage would not be effective in treating a majority of the malaria cases seen in native laborers of the Caribbean zone. Furthermore, larger quantities of quinine in watery solution have proven too irritating to the rectal mucosa. The technic devised by the writer and described below has permitted the exhibition of quinine by rectum in large dosage without discomfort to the patient or inability to retain the medicament.

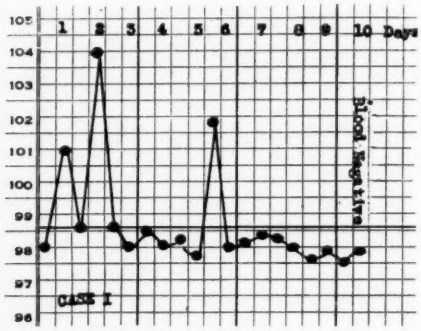
Effectiveness of Method.—Infection by all varieties of malarial organisms as well as mixed infections have been successfully dealt with in this manner. No case has failed to respond to treatment, and in none has treatment been modified or supplemented by oral or parenteral administration of quinine (excepting in those cases receiving an initial routine dose of quinine by mouth upon admission and before the establishment of definite diagnosis). Furthermore, clinical "cure", as well as elimination of parasites from the peripheral blood, has been accomplished as rapidly and as effectively as by oral administration.

CASE RECORDS

Ring forms are denoted O; gametes C; marked infection one plus; heavy infection two plus; severe infection three plus; dangerous four plus. The designations are those of Mr. L. R. Matthews, Laboratory Technician, Quirigua Hospital, who made all blood examinations and reports as a part of the routine laboratory work.

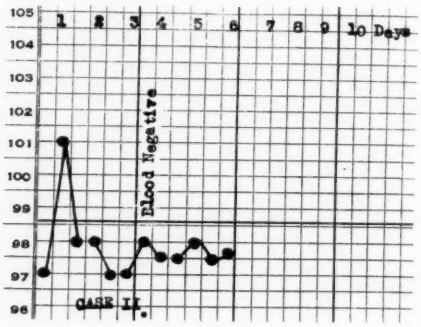
Case I.—Case 77, age 34, a negro, was admitted January 10, 1929, to Quirigua Hospital. He had pain in the back and left loin; the condition was fair. The blood smear was positive, quartan O three plus. He received 30 grains of quinine daily, by rectum, for eight days. On the fifth day, the blood smear was quartan one plus. The second chill occurred the same day. The temperature was normal on the seventh day. The blood was negative on the ninth day. He was discharged January 20, 1929. He had not complained of tenesmus or irritation from treatment. All injections were retained.

Case I.—Quartan O three plus



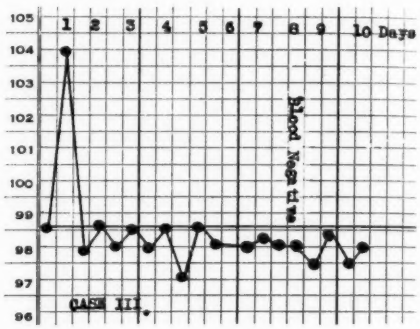
Case II.—Case 398, Quirigua Hospital, was admitted March 4, 1929. He was 35 years old, a native. He had fever, chills and headache for five days. His condition was fair and spleen two plus. Blood smear showed tertian O. There were uncinaria ova in the stool. He received 60 grains of quinine daily by rectum for four days. His temperature was normal on the second day. His blood was negative on the fourth day. He was discharged March 9, 1929. He had no tenesmus. All injections were retained.

Case II.—Tertian O



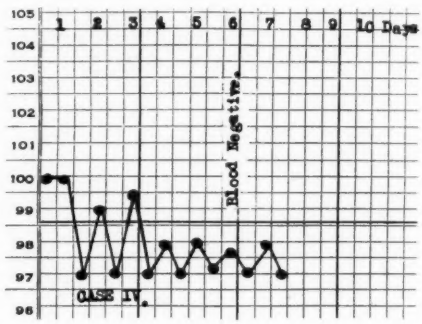
Case III.—Case 375, Quirigua Hospital, was admitted March 1, 1929. He was 21 years old, a native. He had had fever for twenty days. He was discharged one month previously, after treatment for cerebral malaria. His blood was negative on discharge. Blood smear showed tertian O two plus. He received 60 grains of quinine daily by rectum for six days. His temperature was normal on the second day. His blood was negative on the seventh day. He was discharged March 10, 1929. He had no tenesmus. All injections were retained.

Case III.—Tertian O two plus



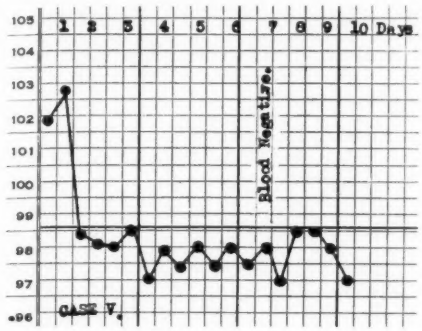
Case IV.—Case 358, Quirigua Hospital, was admitted February 26, 1929. He was a 27 year old native. He had headache, fever and pain in the back and spleen for four days. His condition was fair. Blood smear tertian O three plus. He received 60 grains of quinine daily by rectum for five days. His temperature was normal on the third day. His blood was negative on the fifth day. He was discharged March 5, 1929. He had no tenesmus. All injections were retained.

Case IV.—Tertian O three plus



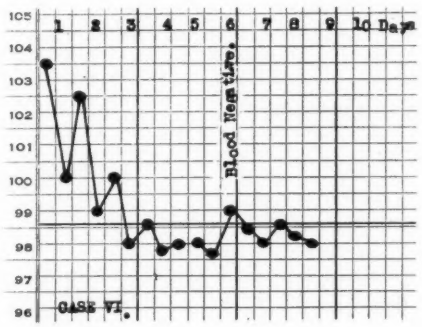
Case V.—Case 134, a 20 year old white native, was admitted to Quirigua Hospital January 23, 1929. He had had fever, chills and nausea for two days. His condition was fair. Blood smear showed estivo-autumnal forms O three plus C. He received quinine 60 grains daily by rectum for seven days. The blood smear on the third day contained estivo-autumnal parasites O one plus C. His temperature was normal on the second day. His blood was negative on the sixth day. He received a course of plasmochin, after completing the rectal injections. He was discharged February 3, 1929. He had no tenesmus. All injections were retained.

Case V.—Estivo-autumnal O three plus C



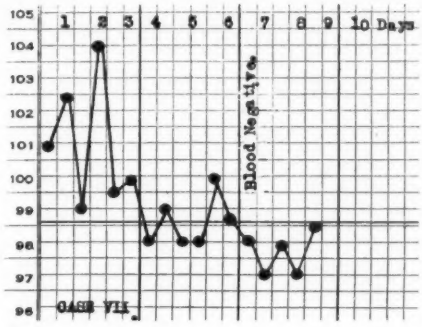
Case VI.—Case 269, a native, age 24, was admitted to Quirigua Hospital February 11, 1929. He had had fever for one week. His condition was fair. The blood smear contained estivo-autumnal parasites, C one plus. He received 60 grains of quinine daily per rectum for four days. His temperature was normal on the third day. His blood was negative on the fourth day. He was put on "tonic tablets" and plasmochin. He was operated upon for chancroid and inguinal adenitis March 19, 1929, and discharged April 7, 1929. There was no tenesmus. All injections were retained.

Case VI.—Estivo-autumnal C one plus



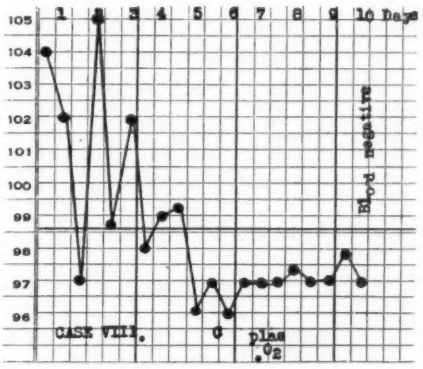
Case VII.—Case 535, a native, age 17 years, was admitted to Quirigua Hospital March 27, 1929. He had had fever and headache for one week. His condition was fair. His spleen was three plus. The blood smear contained estivo-autumnal parasites O. He received 60 grains quinine daily by rectum for two days. His temperature was normal and blood negative on the third day. He was given a course of quinine and plasmochin (os) for six days. He was discharged April 5, 1929. There was no tenesmus. All injections were retained.

Case VII.—Estivo-autumnal O



Case VIII.—Case 321, a native, age 20, was admitted to Quirigua Hospital February 21, 1929. He had had fever, nausea, headache and pain in the back for four days. His condition was fair. His spleen was three plus. The blood smear contained estivo-autumnal parasites O. He received 60 grains quinine daily by rectum for six days. The temperature was normal on the fourth day. The blood smear on the sixth day showed estivo-autumnal forms C. He was given three plasmochin tablets, 0.01 gram each twice daily for four days. The blood smear was negative March 3, 1929, and he was discharged the same day. There was no tenesmus. He expelled the greater part of the second quinine injection.

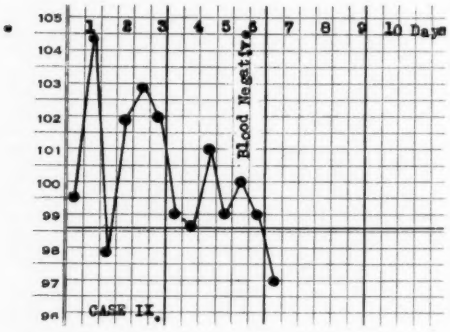
Case VIII.—Estivo-autumnal O



Case IX—Case 52, a native, age 18, was admitted to Quirigua Hospital January 7, 1929. He had had fever and headache for four days. His condition was fair. The blood smear was negative on admission. The blood smear the second day contained estivo-autumnal parasites O. He received 45 grains quinine daily by rectum for six days. His temperature was normal on the fourth day. The blood smear was negative on the fifth day.

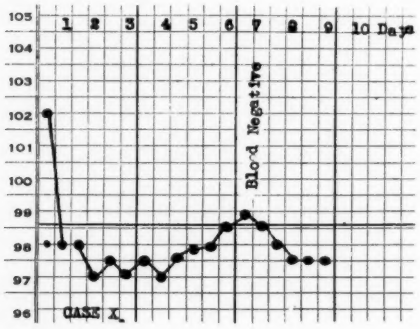
He was discharged January 13, 1929. He complained of slight tenesmus for two days. He retained all injections.

Case IX.—Estivo-autumnal O



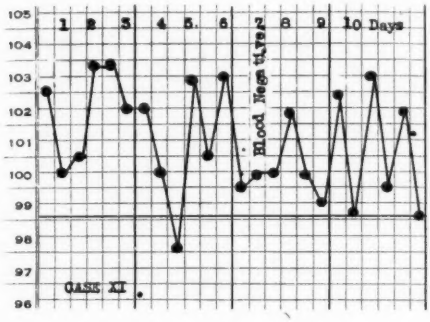
Case X.—Case 133, a native, age 25, was admitted to Quirigua Hospital January 23, 1929. He had had fever for two months and swelling of the right side of the neck. The blood smear contained estivo-autumnal parasites O one plus, and tertian O two plus. He received 60 grains of quinine daily by rectum for seven days. His temperature was normal on the second day. The blood smear on the third day contained estivo-autumnal forms O, and tertian O one plus. The blood smear on the sixth day was negative. The swelling of the neck subsided on the third day. The quinine course was followed by two tablets of plasmochin of 0.01 gram each three times a day for five days. He was discharged February 3, 1929. There was no tenesmus. All injections were retained.

Case X.—Estivo-autumnal O one plus, Tertian O two plus



Case XI—Case 89, a native, age 14, was admitted to Quirigua Hospital January 13, 1929, with a mixed infection of malaria and miliary tuberculosis. He had had fever and a cough for six days and had been admitted three times previously for cerebral malaria. His condition was poor and he was stuporous. There were rales throughout both lungs. His spleen was four plus. His blood smear contained estivo-autumnal O one plus, tertian O four plus. He received seven daily rectal injections of quinine, three of 45 grains and four of 60 grains. The blood smear was negative on the seventh day. The temperature was lowered on the sixth day. There was no tenesmus, and all injections were retained. He died on the forty-ninth day. Autopsy showed acute general miliary tuberculosis and tuberculous meningitis.

Case XI.—Estivo-autumnal O one plus, Tertian O four plus, Miliary Tuberculosis



TECHNIC OF ADMINISTRATION

Upon admission and diagnosis, the patient is given by mouth 2 ounces of a saturated solution of magnesium sulphate. Two hours later, a soapsuds enema is ordered and an hour after expulsion of the enema, 60 grains (average adult dose) of powdered quinine sulphate in 2 ounces of olive oil is deposited in the rectum. Doubt concerning the expulsion of the cleansing enema may be eliminated if it is desired by washing out the colon with water before giving quinine. The quinine mixture should be well stirred and shaken to ensure even emulsification. It is poured into a funnel connected with a large soft rubber catheter or rectal tube, which has been introduced 3 to 4 inches into the rectum, and allowed to enter the rectum by gravity. A rubber bulb syringe may be used. When the last of the emulsion has gone through the funnel, the catheter is gently "milked" toward the anus to ensure deposition of the entire dose. The catheter is then withdrawn, and the patient told to resist all inclination to defecation for six hours. If the colon has been well evacuated prior to treatment, there is seldom any difficulty in carrying out this technic. Rest in bed is, in most cases, a necessity. In seriously ill patients it may, of course, be imperative that quinine be given immediately upon admission. The preliminary dose of magnesium sulphate may then be dispensed with, the patient receiving an enema

upon admission, and the quinine enema as soon as the cleansing enema is expelled.

After the first treatment is given, the following routine is established: one hour before the evening meal the patient is given 2 ounces of magnesium sulphate. This will normally assure a complete evacuation before the patient has gone to sleep. At 7 a. m., the following morning, a soapsuds enema is administered, and at 8 a. m., or after expulsion of the enema, the quinine-oil instillation is carried out. In this manner, sleep is not interfered with, and the patient is able to devote his energy to the necessity of retaining the deposited dose of quinine for six hours. During this period of the day, he is easily kept under observation. It is not necessary to restrict fluids during the six hour interval (although some patients find it more convenient to do so) and the dietary is not interrupted. At 2 p. m., the patient is told that he is at liberty to evacuate his bowels. Many find this unnecessary, securing sufficient elimination from the nocturnal saline aperient and morning enema. In this method of treatment, quinine is administered only once during each 24 hours.

RESULTS AND RATIONALE OF TREATMENT

Analysis of the cases reported indicates that quinine administered in the manner described compares favorably in effectiveness with its use by more conventional methods. Although the rate of absorption and elimination has not been tested, it appears probable that quinine emulsified in olive oil is absorbed slowly through the rectal mucosa and the lymphatic tributaries of the portal system. Suggestive of this slow but regular assimilation of quinine is the fact that symptoms of cinchonism are often diminished in severity, and are sometimes absent.

No patients have been unable to carry out the treatment. A few injections have been expelled. These have been replaced quantitatively. A single patient has complained of tenesmus, and one of abdominal discomfort. No instances of diarrhea or bloody stools have been noted.

A probable advantage in treating estivo-autumnal malaria by this method is furnished by the knowledge that estivo-autumnal parasites sporulate, to a large extent, in the portal tributaries, where they would be particularly exposed to contact with the quinine derivatives emanating from the pararectal lymphatics and venous sinuses.

The fact that substances absorbed from the rectum (whether by venous channels or the lymphatic system) are conveyed to the liver, may constitute an added advantage in hastening the development of the active quinine derivatives or "metabolites." Quinine absorbed from the stomach rapidly finds its way in part, at least, to the systemic circulation, where its dissemination produces the symptoms of cinchonism.

From a practical standpoint, the method of treatment herein described has some merit in dealing with large numbers of ward patients. Two well trained orderlies can carry out the treatment on a number of persons in a surprisingly short time.

Plasmochin may be added to the emulsion. By so doing, anti-malarial therapy may be reduced to a single daily dose of quinine and plasmochin. The expense of olive oil (mineral or Wesson oil) must of course be added to treatment. Ulcerative colitis, anal fissure and inflamed hemorrhoids may be contraindications to any form of rectal therapy.

CONCLUSIONS

(1) Satisfactory results in reduction of malaria temperature and elimination of parasites from the peripheral blood have been attained by the rectal administration of quinine in olive oil.

(2) This method has not been employed in gastro-intestinal or cerebral cases. Selective use of the method in these and other grave forms of malaria is indicated if speed of action is not of primary concern, and if adequate control of administration is assured.

(3) Certain disadvantages and objectionable features of other methods of quinine administered are foreign to its use by rectum.

REFERENCES

1. Maxcy, K. F.: Limitations to the Use of Quinine Intravenously in the Treatment of Malaria. Pub. Health Rep., 37:693-701, Reprint 736, March 24, 1922.
2. Maxcy, K. F., et al: Limitations to the Use of Quinine Intravenously in the Treatment of Malaria, J.A.M.A., 91:1372, November 3, 1928.
3. Dudgeon, L. S.: On the Effects of Injections of Quinine into the Tissue of Man and Animals. Jour. Hyg., 18:317-336, October, 1919.
4. Fletcher, William: Notes on the Treatment of Malaria with the Alkaloids of Cinchona. London: John Bale Sons and Danielsson, 1923.
5. Wilcox, W. H.: Treatment of Malaria. Brit. Med. Jour., 2:796-797, London, 1919.
6. Ross, R.: Mode of Quinine Administration. Brit. Med. Jour., 1:130, London, 1920.
7. Suzuki, T.: Cases of Malaria Fever Treated per Rectum with Quinine. Jour. Oriental Med., Darien, 2:233-238, 1924.

MALARIA AND HOOKWORM IN VENEZUELA*

By J. B. Ascanio-Rodriguez, M.D.,
Caracas, Venezuela

As a representative of the National Public Health Service of Venezuela, I have the honor and the pleasure of presenting to the National Malaria Committee and to the Southern Medical Association, the greetings of my Government, my people and our profession.

I have been greatly interested in this meeting. We have our malaria problems in certain parts of Venezuela.

I shall summarize very briefly a few of my own observations and those of my colleagues.

(1) We have sixteen species of mosquitoes that are said to convey malaria, but none of those mosquitoes has ever been found naturally infected.

(2) Experimentally, Dr. Benarroch has not been able to infect these mosquitoes.

(3) I have found that malaria is nearly always in association with hookworm.

(4) I have found the hemoglobin in hookworm disease often as low as 50 per cent. If hookworm is eliminated the hemoglobin rises to 70 per cent and stays at 70.

(5) Where concurrent infection exists, the elimination of hookworm very often is followed by the disappearance of fever associated with malaria, though the parasites are still to be found in the blood.

(6) If we give daily injections of compounds of iron after the treatment for hookworm, we find that when the hemoglobin reaches 90 per cent the malaria parasites disappear and I have never seen relapse where the hemoglobin is maintained at 90 or 95 per cent.

(7) For nearly the last twenty years my Government has carried on over all the country a campaign against both malaria and hookworm. This campaign has been extensively increased in the last year.

(8) Recently we have been greatly aided by the scientific investigations of the Rockefeller Foundation, an institution with which you are all familiar.

*Remarks before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

HOOKWORM AND MALARIA*

By Henry Hanson, M.D.,
Jacksonville, Fla.

"The literature of malaria is voluminous; the contributions and text books by authority are few; the lubrications of the tyro are multitudinous, and probably over no disease has wrangling, international and internecine, been so considerable as over malaria," says Angus MacDonald.

It is, however, with the hope of obtaining further information from a discussion of the subject by health officers and others interested in the problem that I present hookworm and malaria infection as factors which combine in causing poor economic conditions in rural districts along the Gulf Coast.

My interest in these two diseases was stimulated while I was serving as a field medical officer in the Bureau of Communicable Diseases, under the direction of Dr. F. A. Brink, in District No. 5, comprising ten counties in the western portion of the State of Florida. An opportunity was presented to compare the incidence of malaria in a portion of the United States which borders on the tropics, with those with which I had had some experience in various portions of the tropics. In a brief study[2] made in West Africa, I found that 80 per cent of children in the Idaban, Ilorin, Ado-Ikiti area showed malaria parasites in a single thin smear examination. The ages of the children examined varied between one month and ten years. Sixteen per cent were infected during the first six months of their existence; 41 per cent were infected before one year of age; 66 per cent before they had passed the third year of life.

The most interesting phenomenon noted in the examination of the African children was that of phagocytosis of red blood cells containing ring forms, both in quartan and estivo-autumnal infections.

The phagocytosis occurred in one child (Adejuwon) nine months old, with estivo-autumnal infection, in one three years old with estivo-autumnal infection, in one six years old with quartan infection, and in one eight years of age with quartan infection. It appeared rather significant to find the phagocytosis in these natives, none of whom had taken quinine or complained of illness. Dr. Clark, of the Colonial Medical

*Read in Section on Public Health, Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

Service, reported (verbally to the writer) that in a similar series he very seldom obtained positive smears from the blood of Nigerian adults. My limited series from similar adults gave only 5 per cent positive malarial smears. It appears that the native adult is immune to the local strain of malaria but not necessarily to that of the parasite on the east coast of Africa.[3] Is it not plausible to ascribe the immunization to the phagocytosis which occurs among those who are not treated with quinine?

Erythrophagocytosis has been observed by Craig[4] in malaria and by Connal[5] in hematozoic infections, but is not otherwise commonly mentioned in medical literature. It is probable that if a more minute examination were made of blood smears, phagocytosis would be more frequently seen.

While we were conducting typhoid immunization clinics in the flooded areas along the Choctawhatchee and Yellow Rivers, more than half of the people attending asked for some help in combating malaria. Certain quacks had canvassed the country giving "shots," which they claimed were malaria preventive. It appeared that these were inoculations of sodium cacodylate, a good tonic, but of no value as a cure or control for malaria. The propaganda of the charlatans had created the erroneous notion that malaria might be prevented by inoculations as in the case of typhoid or diphtheria. Many of the country people who came to the clinics did so because they believed the anti-typhoid inoculations were prophylactic measures against malaria.

Unfortunately it appears that the practice of physicians sometimes leads to the belief that both cure and prevention of malaria rests with the hypodermic. Many persons showed arms scarred from abscesses resulting from quinine inoculations. While hypodermic medication is used to a considerable extent in some parts of South America and to some extent among the colonials on the West Coast of Africa, it is not the method of choice either for the cure of malaria or its prevention. The modern malariologists object to the use of prophylaxis as applied to the control of the disease by administration of quinine. Under conditions usually met in the tropics quinine control is often the only means available which enables the laborer or traveller to carry on without interruption by an acute attack of fever. Under such conditions quinine should be taken by mouth (in West Africa 5 grains daily is the prescribed dose) and not by the needle.

In order to obtain some data on the incidence of malaria in the subtropical portion of the United States, comparable with that which I had obtained in the tropics, I took 531 blood smears from persons of all ages attending the immunization clinics referred to above; from persons living in and adjacent to the flooded areas along the Choctawhatchee, Yellow and Escambia Rivers in West Florida. The ages of those examined varied between two and seventy years. The laboratory reported 58 per cent positive for parasites. Five hundred of these smears were taken in two counties, one of which has reported a mortality rate of 105 per 100,000 population and the other 164, which tends to harmonize with the survey finding. One hundred and five of those examined were colored people, mostly farmers. The incidence of positives did not vary materially in either race.

From observation of the children and many adults throughout this portion of the State it appeared that malaria alone was not the most serious condition. Many persons showed marked evidence of hookworm infection.

Examinations of the stools from children in various schools gave on incidence of infestation ranging from 50 to 80 per cent. In one small school of 19 pupils and one teacher, all showed hookworm eggs in the stools. Even if one makes the distinction between hookworm infestation and hookworm disease, as is done by the experts in this subject, all are very important from the sanitarian's viewpoint. It has been said by Darling, Smillie and others that an individual may carry 30 or 40 worms without showing physical evidence of disease. Ashford[6] says that one female worm may deposit as many as 9,000 eggs in 24 hours, which would mean a soil pollution of 360,000 potentially infective larvae per day from each such individual. What the number of infective larvae would be from one with active hookworm disease might run into staggering figures. In an autopsy I recovered 150 worms from a piece of intestine about a yard long. These conditions graphically emphasize the importance of isolation of the infective stools by the use of appropriately constructed privy vaults in rural communities.

It has been the purpose of this paper merely to point out the importance of the two diseases as coexisting factors affecting the economic conditions where they prevail. In the counties where the conditions prescribed prevail, the land

is good, and farming would be profitable if the two diseases were controlled. There are no other deterrants to prosperity.

REFERENCES

1. MacDonald, Angus: Nelson's Loose-Leaf Living Medicine, Vol. vii, p. 332.
2. Hanson, Henry: Amer. Jour. Trop. Med., Vol. viii, p. 249, 1928.
3. Ibid (Discussion by Dr. Klotz), p. 255.
4. Craig: The Malaria Fevers. New York and London, 1909.
5. Connal, Andrew: Jour. of Path. and Bact., 16, 509, 1912.
6. Ashford, B. K.: Chemistry in Medicine. The Chemical Foundation, Inc., New York, Chapter 9, p. 641.

DISCUSSION (*Abstract*)

Dr. V. H. Bassett, Savannah, Ga.—Dr. Hanson's figures presenting the percentage of infection are extraordinary and correspond to those often found in field surveys where malaria is especially prevalent. It is to be noted that these high percentages of infection were not secured by a systematic sampling of the whole population, and on that account they are all the more remarkable.

The persons who were examined presented themselves for another purpose, and were selected for examination for malaria only on that account. It is true that they were in a flooded area, but they did not come on account of needing curative treatment.

I would like to ask Dr. Hanson to what extent he found malarial fever and hookworm co-existent and whether they presented any difficulties in the health administration.

Dr. Hanson's observation on the phagocytosis of malarial parasites is also very interesting. It is to be hoped that he will be able to continue these studies and explain something of the mechanism of the apparent immunity established in the adults living in a malarial district.

Dr. W. S. Leathers, Nashville, Tenn.—I wish to ask Dr. Hanson if he has any data relative to the degree of infestation from hookworm disease in the area referred to in his paper; and also whether he has information with reference to the number of people who have both hookworm and malaria. Might I inquire concerning the density of population in this area? These questions are asked from the standpoint of the economic aspects of the problem.

It seems to me there is a possibility of overemphasizing the use of plasmochin in malaria work at this time. As I understand it, the use of plasmochin from a therapeutic standpoint is rather in the experimental stage, and in view of the fact that there are methods for the control of malaria which are quite reliable it is well to consider carefully whether it is desirable to use such a substance as a public health measure. In calling the attention of the public to a remedy of this kind we should be quite sure as to its value from a public health viewpoint. Of course, it is perfectly proper to use it in an experimental way in public health work, but I am referring especially to its use as a specific measure in a campaign for the control of this disease.

Dr. A. T. McCormack, Louisville, Ky.—I wish that Dr. Hanson would tell us something about the incidence of pellagra in this section. From economic reasons, one would expect to find much pellagra here.

Dr. Hanson (closing).—The apparent incidence of pellagra was very low. About five patients said that they had pellagra, but the evidences were not definite and the symptoms not pronounced. They did not seem to be suffering severely from pellagra.

I hesitate to mention plasmochin, because I have already noticed that there is a tendency to substitute plasmochin or quinine. I do not attempt to say that there is anything but quinine that will cure malaria. We know quinine has to be given in minimum doses of 10 grains three times a day, over a long period of time following the initial vigorous treatment by 30 to 45 grains daily.

In my own personal experience in West Africa: I took 45 grains of quinine a day for about one week and then dropped down to 20, 10 and 5 grains, which was the therapeutic practice advocated there. The question that I hoped would be raised was whether 5 grains is enough for quinine control. Five grains is used by the West African colony; it is what they depend on to keep their people working; and those who used it did not take malaria.

My own attack developed while I was in the interior for three weeks after leaving off the control dose of 5 grains daily. An active soluble product is essential, such as the bimuriate of quinine.

MALARIA CONTROL BY USE OF PARIS GREEN: PRELIMINARY REPORT ON COUNTY-WIDE WORK IN DOUGHERTY COUNTY, GEORGIA*

By T. H. D. GRIFFITTS, M.D.,†
Albany, Ga.

Location and Physiographic Features of Dougherty County.—This County is situated in the southwestern section of the State of Georgia, the western border being about thirty-six miles from the Alabama line, and the southern border approximately fifty miles from the northern line of Florida. It is bounded on the north by Terrell and Lee Counties and east of Flint River by a small portion of Worth County; on the east by Worth County; on the south by Baker and Mitchell Counties, and on the west by Calhoun County, from which county it is separated by the Chickasawhatchie Creek. The northeastern projecting corner of this County is separated from Lee County by the Flint River, which flows in a southwesterly direction to the City of Albany and thence south, through the County, to form the boundary between Mitchell and Baker Counties. (At the extreme

*Read before the National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†Epidemiologist, U. S. Public Health Service.

southwestern corner of Georgia the Flint and Chattahoochee Rivers unite to form the Appalachicola River in Florida.) North of the City of Albany, dams across Flint River and Muckafoonee Creek impound the waters of the river, Muckafoonee, Kinchafoonee and Muckalee Creeks for the hydro-electric development of the South Georgia Power Company. By this impoundage more than a third of the northern border area of Dougherty County now contains a large body of quiet water, where formerly the water was contained in defined channels except at flood stage. The total area of the County is 343 square miles, or 219,520 acres. The extreme length of the County, east and west, is about 28 miles, while the extreme width, north and south, is approximately 12.5 miles. The physiographic features of this County are rather uniform. The greater part of Dougherty County lies within what is known as the Dougherty Plain, as the smooth country of southwest Georgia is designated.* All of the County lies in this division of the Coastal Plain except the southern section. The Flint River and Cooleewahee Creek divide the County into three practically equal areas extending from north to south, or east, middle and west sections. That section lying east of Flint River is the smallest, while the middle and west areas are of about equal size. The middle area (between Flint River and Cooleewahee Creek) is further divided by the depression occupied by Percosin Creek: the western area is traversed by Kiokee Creek, with Tallahassee and Mud Creeks as its main tributaries. Chickasawhatchee Creek borders the County for the entire distance on the west. The general surface of this Plain is level, undulating or slightly rolling. The elevation varies from 190 to 215 feet above sea level.

Lime Sinks.—Outstanding features of the surface of the County are the extensive and numerous "lime sinks," more or less irregular depressions varying in size from small areas to those occupying two or three hundred acres. In the western section of the County the depressions assume more of the character of swamps with sluggish streams. Most of the lime sinks during a season of high rainfall become ponds of more or less constancy. Many of the lime sinks do not contain water during a dry season or even in seasons of average rainfall. However, there are many important lakes and ponds in the southerly portions of the middle and west divisions of the county which are permanent bodies of water. The swamps support growths of cypress, bay, tupelo and black gum, smilax, "maiden cane" (*Panicum hemitomum*) and other hydrophytic plants. The shallow ponds generally support a rank growth of maiden cane.

The natural drainage of Dougherty County is by four streams (and tributaries) running in a southerly direction, namely: Flint River, Cooleewahee, Kiokee and Chickasawhatchee Creeks (western boundary). The valleys of the creeks are generally wide and shallow, while Flint River courses in a winding manner through the County in a channel 20 to 50 feet below the level of the highlands. In many places almost level terraces border this River, ranging in width from a few yards to a mile or more.

Soils.—The County is about midway between the "fall line," or the inner border of the Coastal Plain, and the Gulf Coast. It is in the belt of red soils, and all but two of them are sandy in character.

"They range in texture from light, loose deposits of sand to a sandy clay loam and sticky, plastic clay, only slightly sandy at the surface. While most of the soils are very sandy at the surface, all but a few grade into a friable, sandy clay subsoil, either within the three-foot soil section or just below. Generally this sandy clay in turn grades into a compact, heavy, matted clay also carrying some sand. Several soil types, besides being sandy, also contain considerable quantities of concretionary gravel, . . . as in the eastern and western sections of the County and occasionally . . . on each side of Flint River. These gravels, or pebbles, are aggregations of limonite, iron oxid, with sand and clay impurities. Bedrock is found all over the County at no great depth. This consists chiefly of limestone. . . . Solution of the limestone and the sinking down of the overlying materials into "lime sinks" has formed one of the most conspicuous topographic features of the region and has an important influence on the derivation and formation of some of the soils. . . . These limestones are of three different formations: the Vicksburg, the Chattahoochee and the Alum Bluff." The Vicksburg "underlies the whole County except in the extreme eastern and southeastern parts. Along the eastern boundary the latter two formations (Chattahoochee and Alum Bluff are found, with the Altamaha or Lafayette in the extreme southeastern corner."*

Climate.—The southwest section of Georgia has long, warm summers and mild winters. Summer weather conditions may last from March until November. The mean temperature during this period is about 60° F. for the end months and 80° F., or a little higher, for the midsummer

*Veatch, Otto: Geology of the Coastal Plain of Georgia. Bull. No. 26, Geological Survey of Georgia, p. 30.

*Soil Survey of Dougherty County, Georgia, U. S. Department of Agriculture, Bureau of Soils, Washington. Government Printing Office, Oct. 17, 1913.

months, the mean for July being 82.9° F. Owing to relatively low humidity, the heat is not oppressive as in many other localities. A temperature of 100° F. may be reached repeatedly in the daytime, but the nights are cooled by breezes from the south or southwest. The extreme maximum temperature reached in 22 years was 106° F. during July; the extreme minimum was —2° F. (only once), and otherwise the lowest recorded was 12° F. There are usually several days each winter when the temperature goes below the freezing point, and these may be interspersed with balmy days. The first killing frost usually occurs about the middle of November, and the last in the spring is about the first week in March. Killing frosts have occurred as early as October 23 and as late as April 15. The annual average rainfall is approximately 50 inches. Precipitation is fairly well distributed throughout the year, although the "growing season" usually has the greatest rainfall, while the months of least rainfall are the autumn months.

The following tables show the temperature and rainfall records, by months, and departures from normal, with other climatological data, for the years 1928 and 1929 for Albany, Dougherty County (U. S. Weather Bureau data, Albany, Ga., Station):

It will be seen from the above records that in both 1928 and 1929 there was an excess of more than 15 inches above the normal annual rainfall.

1928

Month	Temperature, Degrees Farenheit						Precipitation—in.			No. of Days				Direction	Miscellaneous
	Mean	Departure from Normal	Highest	Date	Lowest	Date	Total	Departure from Normal	Snowfall	With Precipitation	Clear	Partly Cloudy	Cloudy	Prevailing of wind	
January	47.6	—2.6	78	17	15	2	2.33	—1.74	O	5	19	6	6	N	Last killing
February	52.4	0.4	78	4	21	19	7.80	2.79	T	11	18	4	7	N	frost in Spring,
March	60.6	0.1	89	29	38	3	5.78	1.06	O	13	15	0	16	SW	February 20.
April	64.2	—2.6	86	26	41	1	12.96	9.38	O	8	20	1	9	S	
May	72.0	—2.5	95	18	45	9	1.48	—2.42	O	7	20	3	8	W	
June	79.8	—1.0	98	20	59	8	7.79	3.37	O	11	19	3	8	S	
July	82.2	0.1	96	3	69	7	4.02	2.14	O	13	20	3	8	SW	
August	82.1	0.5	97	4	70	22	7.98	2.41	O	17	13	0	18	S	
September	75.8	—2.2	94	1	50	25	9.67	6.45	O	16	16	2	12	SE	
October	71.5	3.7	89	6	45	25	1.27	—1.19	O	6	21	3	7	NE	
November	55.8	—2.1	81	17	28	27	0.81	—1.53	O	3	23	0	7	N	
December	51.1	—0.2	83	13	26	10	3.04	—0.75	O	7	20	4	7	N	First killing
Sums	.....	.....	.....	.....	.....	.....	64.93	15.69	T	117	224	29	113	N	frost in Fall,
Means or extremes	66.3	—0.7	98	June 20	15	Jan 2									November 21.

1929

Month	Temperature, Degrees Farenheit						Precipitation—in.			No. of Days				Direction	Miscellaneous
	Mean	Departure from Normal	Highest	Date	Lowest	Date	Total	Departure from Normal	Snowfall	With Precipitation	Clear	Partly Cloudy	Cloudy	Prevailing of wind	
January	54.2	4.0	82	18	27	3	7.29	3.22	O	15	16	0	15	N	Last killing
February	52.4	0.4	81	27	29	12	8.13	3.12	O	11	15	5	8	N	frost in Spring,
March	63.8	3.3	92	24	40	11	9.97	5.25	O	10	20	2	9	NW	February 18.
April	72.0	5.2	90	6	47	17	3.74	0.16	O	10	18	1	11	S	
May	75.0	0.5	95	30	48	3	3.26	—0.64	O	14	19	3	9	S	
June	79.4	—1.4	99	21	57	5	4.34	—0.08	O	8	20	6	4	S	
July	81.2	—0.9	97	1	62	21	7.07	0.91	O	12	16	3	12	S	
August	82.4	0.8	98	24	66	29	5.20	—0.37	O	11	15	4	12	SW	
September	77.5	—0.5	95	12	55	20	3.73	0.51	O	13	14	3	13	E	
October	66.5	—1.3	85	8	41	26	5.47	3.01	O	4	25	2	4	NE	
November	60.1	2.2	87	3	23	30	2.74	0.40	O	10	14	7	9	NE	
December	47.4	—3.9	77	12	21	20	4.14	0.35	T	9	23	1	7	N	First killing
Sums							65.08	15.84	T	127	215	37	113	S	frost in Fall,
Means or extremes	67.7	0.7	99	June 21	21	Dec. 20									November 30.

For the first four months of 1928, there was an excess of 11.49 inches. In 1928, May and July were relatively dry months, while June, August and September were wet. In 1929, May, June and August were slightly dryer than normal, while July and September were less than an inch each above normal in rainfall. However, the summer in each year had sufficient rainfall to keep many of the ponds filled by the early season's heavy rainfall to higher stages than usual. During these same months the departures from the normal mean temperatures were, 1928, minus 4.7, and 1929, plus 12.9. From May to October, inclusive, the mean temperature was very nearly normal in 1928, May, June and September falling below normal; while July, August and October were somewhat higher: plus 0.1, 0.5, and 3.7, respectively. From May to October, 1929, inclusive, June, July, September and October falling below normal and May and August higher: plus 0.5 and 0.8, respectively.

Population.—The estimated total population of Dougherty County is 25,000, of which 11,000 are white and 14,000 negroes. Of this population the City of Albany (the only incorporated town in the County) has 8,900 white and 9,600 negro inhabitants. The rural population is fairly well distributed over the County, although clustered at such settlements as Acree, Putney, Pecan City, Pretoria, Locketts, Walker Station, Ducker and Gillionville. Dougherty County was early occupied by large plantations and a prosperous people. Today there are relatively few plantation homes, while in many parts more or less dilapidated or vacant tenement houses remain. Pecans and cotton are the principal crops, while peanuts are extensively grown and diversified farming is becoming more extensive.

Malaria.—Malaria undoubtedly has occurred in endemic foci in the County from the early settlement. Scarcely anything else could account for the lack of agricultural development in Dougherty County or could paint the drab picture of inactivity existing in many parts. The prevalence of malaria to a serious degree having been acknowledged by the people in general, the business and civic organizations, and the importance of malaria control stressed by the Georgia State Board of Health year after year, the Board of Commissioners of Dougherty County levied a one mill tax in 1929 for the purpose of carrying on malaria control. This tax yielded approximately $17,000.00.

Blood Index.—Blood specimens (thick) were taken from 1680 school children (primary grades) in the City of Albany and in the rural sections of Dougherty County April 10-17, 1929, with the following results:

		No. Ex.	No. Pos.	% Pos.
City white schools	(4)	750	15	2.0
City colored schools	(5)	596	31	5.2
Rural white schools	(2)	22	1	4.5
Rural colored schools	(15)	312	134	42.9
Rural white and colored schools	(17)	334	135	40.2
City white and colored schools	(9)	1346	46	3.4
Total white and colored schools	(26)	1680	181	10.8

The above established spring index represents "carried over" cases from the previous season. It is a high rate of infection. Another index will be taken at the same time in the spring of 1930 and in succeeding years as a measure of results of control efforts. Also, indices are to be taken after the opening of schools each fall. In uncontrolled areas the fall index should present a higher rate, of course, than the early spring index.

Control Measures.—The Dougherty County Board of Health employed a field director for malaria control and he entered upon duty April 10, 1929. No detail survey had been made of the County in order to locate the Anopheles breeding places. The only map of the County available was the soil survey map, which showed the lakes and large ponds. The first problem was to find the important breeding areas and locate them on a map. Only a month could be devoted exclusively to this before control operations were to start. The malaria control division of the Georgia State Board of Health, Mr. L. M. Clarkson in charge, and the United States Public Health Service, through Surgeon L. L. Williams, Jr., in charge of Field Investigations of Malaria, agreed to the establishment of a field station at Albany, to act in an advisory capacity to the local control organization, and for the purpose of conducting research in control methods and allied subjects. The writer was detailed in charge of the station, the other Public Health Service personnel being one sanitary engineer, a clerk and an attendant.

The method* of control determined upon was the application of Paris green, at ten-day periods, to all located important *Anopheles quadrimaculatus* breeding areas. For this purpose the County was divided into three districts of about equal areas with the inter-district lines extending north and south. A foreman, with three men equipped with hand-power dusters and other necessary equipment, was placed in charge of each district. Motor trucks were used for transporting men and material, the foreman acting as driver for each outfit. The larvicidal mixture used was a 15 per cent (by volume) of Paris green (known to have satisfactory lethal qualities) in hydrated lime. The aim was to apply three-fourths pound of Paris green to the acre of water surface. It was early found that hand-mixing of Paris green and lime was not satisfactory, so a standard mechanical mixing machine was installed. In addition to the three hand-dusting gangs, the County also operated one motor boat outfit, operated by two men, with motor truck for carrying the boat and other equipment. The boat used was of metal, flat bottom, 14 foot length, 48-inch beam and 24-inch depth, equipped with a "sea-horse" 3, 2½ horse power outboard motor. The power-dusting outfit was made up of a hopper for holding the mixed dust, a "homelite" generator, a power dust gun and hose and wiring attachments. One man operated the boat and the other handled the power duster. This outfit was employed on the larger ponds and lakes. The South Georgia Power Company operated a similar unit and also did hand-dusting on their body of impounded water. The application of Paris green was made throughout the season of 1929 from May 16 until the latter part of September, when, for several days, high winds interrupted the work.

Costs.—The distribution of costs on the first season's operation (April 10-October 1) was as follows:

Salaries and wages	$3184.97
Transportation	1456.31
Equipment	1027.32†
Materials	2273.97
Incidentals	14.54
Total expenditures	$7957.11

*LePrince, J. A.; and Johnson, H. A.: Development of a Power Dusting Device for Applying Paris Green as an Anopheline Larvicide. Reprint No. 1280, pp. 1001-1017, P.H.R., April 26, 1929.

†Four second-hand trucks from the County Farm were transferred to this work, and only the motors in them were purchased from the malaria control fund.

Results.—It is too early to evaluate accurately the control measures at this time. It may be stated, however, that owing to the fact that a close survey had not been made prior to the beginning of dusting operations, for the purpose of locating all important breeding places of *Anopheles quadrimaculatus,* many specimens of this species continued prevalent in several of the catching stations located in various parts of the County. There were 34 of these stations—mule barns, occupied houses, hollow trees, privies, barrels, fowl roosts. No records were available as to the degree of infestation during previous seasons. The catches of imagoes in the stations (weekly catches) varied from zero in many stations to 616 (the highest single catch). The station known as "Silver Lake Barn" ran high throughout the season with the count never running lower than 241 specimens. Prior to the inauguration of dusting, it was estimated that on one occasion there were 5,000 *A. quadrimaculatus* resting in this stable. With thorough location of additional breeding places in the County, it is hoped that reduction of *quadrimaculatus* will be to a more satisfactory number during the second season. A blood index will be taken in April, 1930, for a measure of the effects of one season's work on malaria reduction. A fall index has already been taken and showed the following results, as compared with the spring index, in 18 white and colored schools in the rural sections of the County:

SPRING INDEX

No. Examined	Positive	Rate
424	136	32.1

FALL INDEX

No. Examined	Positive	Rate
372	120	32.3

It will be seen that the rate of increase was only slight (0.2 per cent), whereas in other malarious sections of Southwest Georgia during the past season malaria is estimated to have increased approximately 30 per cent. It is only fair, however, to await the spring index for trustworthy comparison.

In conclusion, it should be stated that there is no spectacular reduction in malaria anticipated as an immediate result of the measures applied in one season. We are confronted with a relatively high rate of chronic malaria in Dougherty County. Even total extermination of the vec-

tor in one season's operations would not result in an appreciable decline in the morbidity rate in one season.

DISCUSSION (*Abstract*)

Dr. J. A. Ferrell, New York, N. Y.—Malaria control in the Southern states was conducted for about four years (1920-1924) in the towns where the population was dense and the property value sufficient to render drainage and other anti-larval measures economically practicable. Since 1922, efforts have been made to extend control measures to the rural areas or on a county-wide basis. In certain instances the success of these attempts has been notable, but in general the work has not been consistently and intensively carried out. The economic factor is a serious obstacle. Further study for evolving methods and further stimulation to have improved methods applied, will be necessary if the disappearance of malaria from the Southern states is to be greatly hastened through the activities of the health departments.

Mr. L. M. Clarkson, Atlanta, Ga.—We have five counties that are using a combination of Paris green application and drainage for mosquito control. I believe we are working toward a solution of our problem on a county-wide basis.

In one county recently the commissioners decided that draining of ponds was more important than the building of highways, so appropriated $10,000.00 for it.

We believe that 1929 will be marked as the year in which county-wide mosquito eradication was initiated, and that the future looks brighter for the conquest of malaria.

Dr. Noble A. Upchurch, Jacksonville, Fla.—We have not discussed controlling the tide water streams.

Our tide water streams are full of water hyacinths. Hyacinths, of course, are developing in the fresh water streams and coming down and the tide carries them back to the smaller streams.

We Southerners are badly in need of a re-alignment of the financial system for our malaria work. We have educated our lawmakers to some extent, but we do not get enough money for the malaria work.

Mr. Howard R. Fullerton, Nashville, Tenn.—I should like to ask Dr. Griffitts if he is doing any screening work in connection with the malaria control work.

Dr. Griffitts.—None whatever. We desire to be able to evaluate this one method. We shall take a blood index next year and shall not be able to measure the results until we take it.

Dr. Harry G. Grant, Richmond, Va.—It is a remarkable thing that you have a county which will devote $17,000.00 to this work alone. What plan have you for the future? Did you propose that sum as an indefinite expenditure, or what is the final objective?

Dr. Griffitts.—The State Board of Health hopes to reach the point where the county will drain what can be successfully and economically drained. There is no question about this work going on from year to year, but there may develop objections to its continuance indefinitely. If there were a certain amount of drainage that would cut out the amount of temporary work now necessary, we feel the people would be better satisfied in the long run and it would be a job that would last, and we have suggested to the county board to do a certain amount of drainage to get rid of important breeding places, especially within flight range of the City of Albany, not to be dependent year after year entirely on applying Paris green.

Dr. Ferrell.—What do you think it would cost to control the dangerous Anopheles in Dougherty County?

Dr. Griffitts.—I estimate $12,000.00 a year, for a population of approximately 26,000.

Dr. Ferrell.—What is the assessed value in that County?

Dr. Griffitts.—Approximately $17,000,000.

Dr. C. A. Mohr, Mobile, Ala.—Have you any information on the probable dangers of Paris green for live stock?

Dr. Griffitts.—We started the season's work by announcing in the paper two or three times very forcefully that Paris green would not kill anything but wiggle-tails; that it would not kill anything even as sensitive as young shrimp larvae. We had not one single complaint of illness or death of live stock. By the end of the season no one doubted that Paris green was reducing mosquitoes and not destroying anything of value.

Dr. B. J. Lloyd, Washington, D. C.—Since I have been connected with the Pan-American Sanitary Bureau (and, by the way, it is through the Pan-American Bureau, at the request of Mr. LePrince, that these foreign guests are here today) I have wanted to know how to answer questions I am often asked. One is, when one of our people of the United States goes to another country where there is malaria, can he take quinine as a prophylaxis. How much and at what times?

Are you using plasmochin; and, if so, what is it doing for you?

Dr. W. E. Deeks, New York, N. Y.—Mosquitoes can be infected when fed on malaria carriers who are taking full doses of quinine. That question has been solved beyond doubt. Apparently no amount of quinine will prevent mosquito infection. Neither will it prevent infection in man. What it does is to cure by destroying the parasite after it has begun to develop in the red blood corpuscle. We do not believe that quinine destroys the parasite in its sporozoite stage.

So, taken in sufficient dosage, quinine will destroy the parasite after it has begun to develop, but it does not prevent infection. Fifteen grains of quinine daily will prevent the development of malarial symptoms and keep a man at work in the Tropics while exposed to malaria infection. However, when he returns to the States and stops taking quinine, he often comes down with the fever.

There is another point which is often misunderstood. Plasmochin, as far as we know at present, is of some value in the treatment of benign forms of malaria, but we have found it absolutely of no use in the malignant type. So far as we know at present, its greatest value is in malaria control work. Given in small doses of 2 centigrams a week to carriers of sexual parasites, it will prevent mosquito infection. Barber and Komp and Whitmore showed that batches of *Anopheles albimanus* fed daily on crescent carriers who were taking small doses of plasmochin failed to develop oocysts in a single instance; whereas, before taking the

plasmochin and while on quinine only, the mosquitoes fed on them showed a high percentage of infection.

We have been using Paris green now for several years in all the United Fruit Company Tropical Divisions in a 1 to 100 dilution with dust, and no instance of its toxicity to man or beast has been reported to us.

I should like to make a further suggestion on malaria control measures, which I consider very important. In one of our Divisions we attempted control with quinine and plasmochin, neglecting to a great extent the anti-mosquito work. The method was a failure, although much care was exercised in making frequent blood surveys of all camps and treating the carriers. This goes to prove that, in addition to this work, it is necessary to do short-range mosquito control for 300 to 400 yards about habitations, and this control must be maintained. Furthermore, it is not practicable nor economical to have sanitary inspectors continually at work with gangs of men dusting. We demonstrate to our intelligent personnel in charge of labor the methods of control, and get their cooperation in taking up the work themselves and continuing it with their local farm personnel, and have trained sanitary inspectors who make frequent visits to each farm, keeping in touch with and advising them. Labor quarters are daily inspected by those in charge of labor, and the sick found in camp are given 30 grains of quinine daily and two tablets of plasmochin compound once or twice a week. The quinine is continued for four days, after which, if the fever has not subsided, the patient is sent to the hospital; if it has, quinine is kept up for two days, along with two tablets of plasmochin once or twice a week. Then a modified Aiken's tonic tablet, which contains 2 grains of quinine, is given to be taken three times a day as a follow-up tonic treatment.

Malaria control should be considered a community problem, and we are endeavoring, with a fair degree of success, to place the responsibility for its control on the intelligent heads of farm operations, from the superintendent of agriculture on down to the overseer and timekeeper. In areas where there are a large number of Anopheles breeding swamps near habitations which cannot be economically drained or filled, the only protection we can offer is to educate the people to protect themselves by screening and the use of nets. You cannot control the disease with quinine and plasmochin.

We have reduced our hospital malaria rate throughout all the Divisions where we operate from 240 to 80 per 1,000 by the methods I have just outlined. Every individual owner of a farm or dwelling should be made responsible and his attention should be frequently drawn to the locations of mosquito breeding places and each man should be compelled to take care of his own bailiwick.

In our Cuban Divisions the employee hospital malaria rate for 1929 has run about 37 per 1,000, whereas formerly it ran from 300 to 400 per 1,000.

Malaria control is not a sanitary question alone; it is an individual problem for every intelligent unit and should begin by education. Start with the school children, show them mosquitoes and larvae, and explain the various stages in their development from the ova and the reasons for certain selective places for breeding. When the children are taught along these lines, they take the message home to their parents and grow up with a knowledge of this work. That is the only way that we shall succeed in controlling malaria, for it is a problem of sanitation and education which must extend throughout the Country. Malaria may be controlled not by sanitation alone, but with the cooperation of every individual in the malarious region.

Dr. Henry Hanson, Jacksonville, Fla.—The Chief Surgeon for the Antiochial Railroad in South America told me that the malaria rate among the railroad employees was reduced from 25 per cent to about 5 per cent after the systematic administration of quinine was begun.

At the Tropical Oil Company's hospitals Dr. Kimmel told me in the early days there was a malaria admission rate of about 1,500 of employees before quinine prophylaxis among the employees was begun. It then dropped to about 250 in 1924.

Dr. M. A. Fort, Bainbridge, Ga.—During February, 1929, the Winthrop Chemics Company gave me a lot of plasmochin compound tablets for experiment. I persuaded about 50 prolonged malaria cases to come to my office every Saturday for examination and treatment. I gave the tablets as advised by the Company, that is, six tablets a day for adults and children in proportion. I noticed the following:

All symptoms promptly disappeared. A number who had been semi-invalids for many months and who claimed to have taken hundreds of capsules of quinine returned to work in a week. They were enthusiastic about their improvement, and their color improved.

Both schizonts and gametes promptly disappeared from the blood. Nearly all spleens decreased in size rapidly, some of them going from four to six fingers-breadths below the costal border to normal in a few weeks.

My experience coincided with that of Dr. Miller, of Waynesboro, Georgia, who found old "quinine fast" cases improved wonderfully under the plasmochin compound treatment. The reduction in the size of the spleens certainly seemed to be more prompt and greater than I have ever been able to secure with quinine alone. I added quinine to the treatment, however, and each patient got more quinine than that in the tablet.

Nearly 20 per cent of those who took this treatment more than a week developed blue lips. In those cases we suspended treatment until they were normal, and began again with half the dose or less. Toward the last I gave no one the full dose, for it looked too dangerous. If you play with plasmochin in large doses you will have some very blue patients.

In Georgia the quad mosquito does not usually breed in freshly dug brick or borrow pits. In fact, it is often years before this happens. It seems that in a dug out pit soil must wash in and growth appear like that of a natural pond before the quads find it suitable for their development.

Dr. Griffitts.—As to Dr. Lloyd's questions: I think there is a rather general agreement that so-called "prophylactic quinine" fails to prevent malaria infection, but may mask the symptoms. So far, on this Dougherty County work, we have not administered plasmochin.

FURTHER OBSERVATIONS ON THE MALARIA PROBLEM OF WEST TENNESSEE*

By HENRY E. MELENEY, M.D.,
Nashville, Tenn.,

EUGENE L. BISHOP, M.D., C.P.H.,
Nashville, Tenn.,

and

FRANK L. ROBERTS, M.D.,
Trenton, Tenn.

The first intensive studies of the malaria problem of West Tennessee were made in 1928 and have already been reported.[1] This paper is in the nature of a progress report and deals with the results of the summer studies of 1929. The work is a cooperative effort of the Tennessee State Department of Public Health and the Department of Preventive Medicine of Vanderbilt University. The United States Public Health Service has also contributed to the program by studying methods and costs of dusting with Paris green. Their study will be reported separately.[2]

INTENSIVE STUDIES IN DYER COUNTY

Dyer County was selected for intensive study because (1) it was shown last year to have a significant malaria problem; (2) it has a well-organized full-time county health unit; and (3) it has good roads even in the bottom-land sections of the County. The program of study in Dyer County included:

(1) Recording the outline of the flooded portion of the County at weekly intervals until the Mississippi receded within its normal banks.

(2) Locating on a map all the important potential breeding places of *Anopheles quadrimaculatus* in the County.

(3) Catching adults and larvae of *A. quadrimaculatus* at designated stations throughout the breeding season.

(4) Making surveys of certain communities to determine the amount of malaria present and the Anopheles population of the houses.

(5) Making blood surveys of all the schools of the County in the spring and late summer.

A laboratory was established in Dyersburg, from which the observations to be reported were made.

FLOODED AREA

The first rise of the Mississippi River to flood proportions this year reached its peak in Dyer County about April 11, when 198 square miles of the County were under water. By April 25 this had receded to 101 square miles, but rose again to 212 square miles on May 23. This represents 42 per cent of the total area of the County. On May 30 about 200 square miles were still flooded, but one week later, June 6, the Mississippi River was back within its normal banks. Three small patches of low land, totaling about five square miles, and other stretches along the Obion and Forked Deer Rivers, were all that remained under water on that date. Such a rapid receding of the flood is not uncommon in the Mississippi Delta, but the peak of the flood is usually reached in March or April rather than late in May. Considerable Anopheles breeding took place this year before the flood receded, and this undoubtedly caused an increase in the size of the early crop of quadrimaculatus adults.

QUADRIMACULATUS BREEDING PLACES

The mapping of the important breeding places of *A. quadrimaculatus* and all permanent bodies of water and streams was done as time permitted during the summer. The United States Public Health Service group is responsible for much of this work. The drying of shallow pools in the bottom-land during the mid-summer drought makes the estimation of the area of such places rather indefinite. However, as they usually contain many Gambusiae and are almost free from floatage or vegetation after receding from their grassy borders, they are rarely found to contain mosquito larvae and are probably not important breeding places. The following approximate measurements have been made from the map prepared to show potential breeding places.

DATA FROM MAPPING OF DYER COUNTY

Ponds, sloughs and creeks in bottom, area	14 sq. mi.
Rivers with banks which may breed Anopheles when flooded (Obion and Forked Deer Rivers), length of both banks	210 miles
Graded roads in bottom, having borrow pits, length	64 miles
Artificial drainage ditches, length	100 miles

*Read before the National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

*From the Tennessee State Department of Public Health and the Department of Preventive Medicine and Public Health, Vanderbilt University.

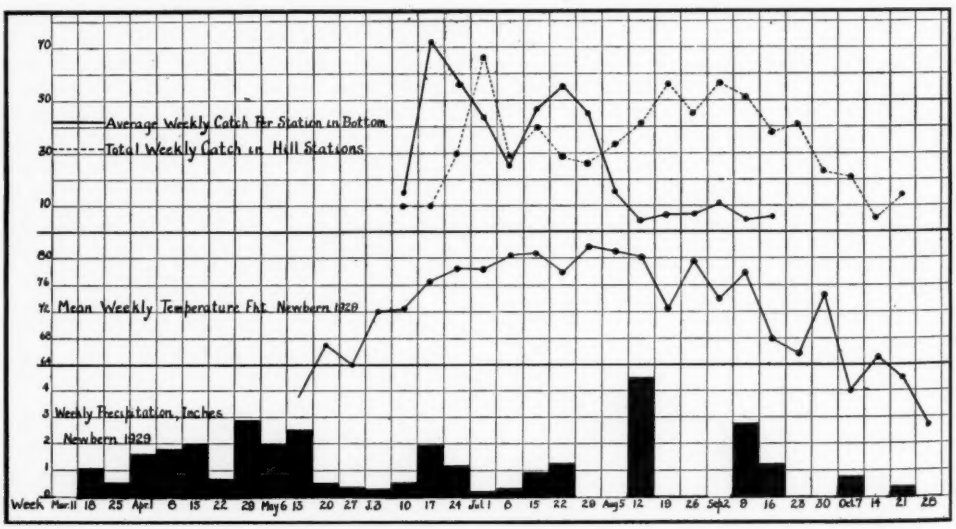
Hill streams, length	125 miles
Borrow pits along hill roads, length	17 miles
Borrow pits along railroads	Not investigated

This probably represents the minimum amount of area in ponds and sloughs which would need treatment of some kind, and the maximum amount of river shore line, creeks, hill streams, drainage ditches and borrow pits. Artificial drainage ditches should not be dangerous if their grade is kept even and their channels free from obstruction. Borrow pits along hill roads and railroads should be drained by the responsible authorities so as to make mosquito breeding impossible. Hill streams may offer special problems because of their irregularities and side pools. They require further study. The treatment of breeding places in the bottom-land is considered in the report by the United States Public Health Service workers.

ANOPHELES CATCHES

Catching stations for both larvae and adult Anopheles were established throughout the County. About 60 per cent of Dyer County is hilly and 40 per cent bottom-land. The stations in the hill section included places along the Obion and Forked Deer Rivers which were much like the bottom-land. The hill stations were visited by a county sanitary inspector and our records are based upon specimens caught by him and brought to the laboratory. The stations in the true bottom-land were visited by members of the laboratory staff. In these stations it was considered more accurate to count the adult mosquitoes than actually to catch them. The difference between these methods would tend to make the numbers recorded from the hills lower and more uniform than those from the bottom-land. Nevertheless, the results give interesting information on the progress of breeding in the two areas.

Graph 1 contrasts the results of the adult catches in the bottom-land with those in the hills, and shows the relation of both to the mean weekly temperature and weekly precipitation as reported at the United States Weather Bureau station at Newbern, nine miles northeast of Dyersburg. Since the counts in the bottom-land stations were always much higher than the catches in the hill stations, it has been necessary, for graphic purposes, to chart all the *quadrimaculatus* adults caught in the hills each week, but only the average number per station from the bottom-land. This brings out the trend of breeding in the two areas. It will be noted that the largest numbers of *A. quadrimaculatus* appeared early in the summer, during the week of June 17 in the bottom-land and two weeks later in the hill section. The cooler water of the running streams in the hills apparently de-

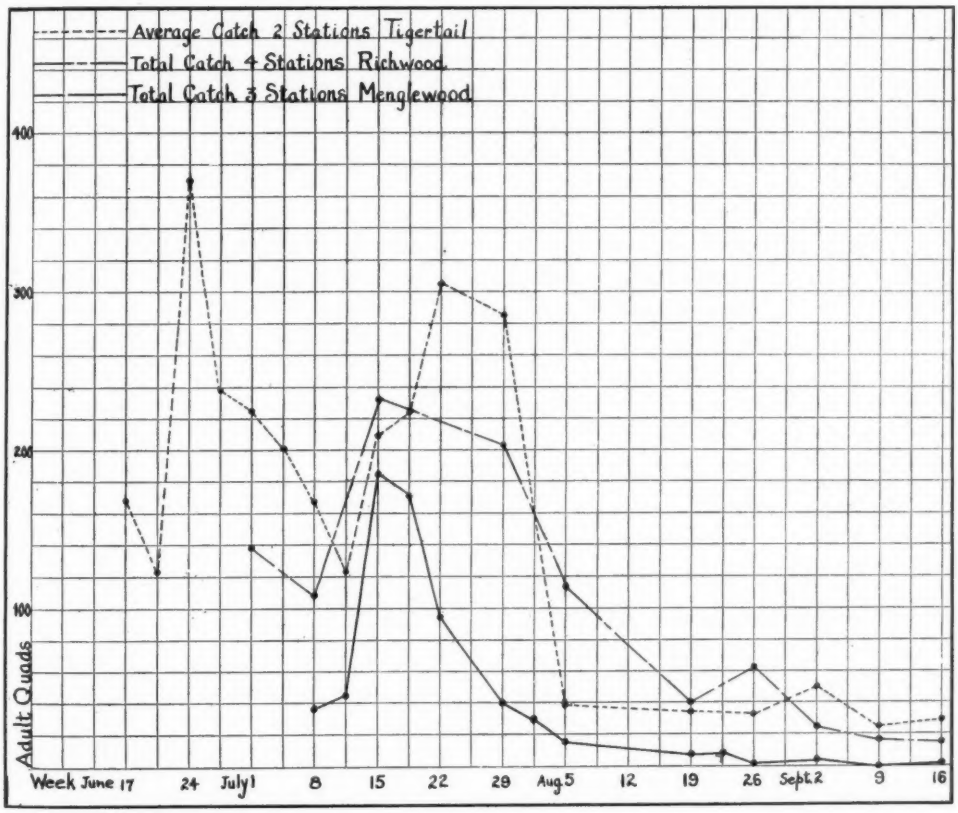

70
50
30
10
Average Weekly Catch Per Station in Bottom
Total Weekly Catch in Hill Stations
80
76
72
68
64
Mean Weekly Temperature Fht. Newbern 1929
4
3
2
1
0
Weekly Precipitation, Inches
Newbern 1929
Week March 18 25 April 1 8 15 22 29 May 6 13 20 27 June 3 10 17 24 July 1 8 15 22 29 Aug 5 12 19 26 Sept 2 9 16 23 30 Oct 7 14 21 28

GRAPH 1

Observations of adult A. quadrimaculatus in catching stations in the hills and bottom-land of Dyer County, plotted against the temperature and rainfall.

layed the development of adults there. The second point of interest is the sudden decrease of mosquitoes in the bottom-land stations coincident with the greatest heat and a period of two weeks without any rainfall. During this period most of the borrow pits and ponds which had remained after the flood, dried up completely. A week with very heavy rain then followed, but three more weeks with practically no rain again dried up the pools so that no great increase of *A. quadrimaculatus* occurred. The third point of interest is that there was no decline in catches of adults in the hill stations coincident with that in the bottom-land, but an actual increase to double the former number. This would seem to indicate less drying up of the hill breeding places associated with running streams.

Graph 2 shows a comparison of the trend of the catches in three different groups of stations in the bottom-land, namely: Menglewood, Tigertail and Richwood. In the Menglewood area the United States Public Health Service group applied Paris green every ten days to two weeks beginning July 10. In the Tigertail area dusting was first done July 16 to 20, and again August 9 to 15. In the Richwood area no dusting was done. It will be noted that all three groups of stations shared in the rapid decrease in the number of mosquitoes at the beginning of August. The Menglewood stations, however, fell off earlier than the others and remained at a very low level. The Tigertail stations, in which the mosquitoes were most numerous, fell off even more abruptly, but not until the first of August, and remained at a somewhat higher level. The Richwood stations fell off more grad-


Average Catch 2 Stations Tigertail
Total Catch 4 Stations Richwood
Total Catch 3 Stations Menglewood
400
300
200
100
Adult Quads
Week June 17 24 July 1 8 15 22 29 Aug. 5 12 19 26 Sept. 2 9 16

GRAPH 2

Counts of A. quadrimaculatus in three groups of catching stations in the bottom-land of Dyer County.

Table 1
Malaria Survey of Communities, Lakes and Dyer Counties, July and August, 1929

District	Date of Survey	Homes Examined	Homes Containing A. quadrimaculatus	Aver. number female quads per house	Number of Histories Taken	Positive Malaria History 1928 or 1929	Number of Spleens Examined	Enlarged Spleens (P or larger)	Number of Blood Specimens	Blood Specimens Positive	Classification of Positive Spleens					Location Of District
											P.D.I.	P	1	2	3	
Richwood Dyer County	July 15-18	34	88%	13	139	62%	66	55%	147	24%	—	9	19	4	4	In bottomland, South of Obion River
Menglewood Dyer County	July 24-26	22	95%	12	111	75%	61	56%	127	52%	—	1	21	9	3	In bottomland on Obion River
Lenox Dyer County	Aug. 5-9	27	87%	7	144	51%	115	35%	210	22%	1	10	21	8	1	On edge of bottomland
Cottonwood Lake County	Aug. 15	24	88%	7	88	73%	56	59%	119	33%	6	11	14	6	2	In bottomland often submerged
Hathaway Lake County	Aug. 16	8	50%	2	35	77%	23	65%	51	10%	2	8	5	2	0	In bottomland near Mississippi River
Madie Lake County	Aug. 12	14	43%	2	86	49%	49	20%	103	10%	8	7	3	0	0	Higher part of bottomland rarely submerged

ually and maintained a relatively higher level than the others throughout August.

COMMUNITY SURVEYS

Dyer County.—Complete malaria surveys were made in three areas. The results are shown in the upper half of *Table I.* The Menglewood area consists of a compact village built on high piles adjacent to a now-abandoned box factory, together with the surrounding farming region close to the Obion River. Our evidence indicates that it is the most malarious community in West Tennessee. Richwood is a purely farming area of scattered houses in the bottom-land half way between the Obion and Forked Deer Rivers. Its lower malaria rate is doubtless due to its distance from these rivers. Lenox is on the edge of the hill region and is crossed by several creeks running into the bottom-land. It has considerably less malaria than Richwood. The Anopheles population of the houses in the three communities is in proportion to their proximity to breeding places and to the amount of malaria present. It is expected that these communities will be used in the future in estimating the efficacy of anti-malaria measures, especially the use of Paris green. The present surveys will serve as a basis for comparison.

Lake County.—The three communities which were surveyed in 1928 were resurveyed this year and the results are given in the lower half of *Table I* for comparison with the Dyer County surveys. Cottonwood has the highest school malaria rate in Lake County, but apparently is less malarious than Menglewood in Dyer County. The other two Lake County communities show a correspondingly lower incidence than those of Dyer County. In *Table II* the Lake County surveys of 1928 and 1929 are compared. Most of the homes in these communities have now been screened by the County Health Department, and a few have also been further mosquito-proofed by papering the interior. There is no change in the percentage of houses containing *quadrimaculatus* mosquitoes, but the number per house in the Cottonwood district is only half what it was last year. This reduction is probably due to the screening. Although there is a slight decrease in the percentage of positive bloods, this is within the range of error in such a survey and one cannot state that there has yet been any reduction in malaria. Obviously thorough mosquito-proofing is necessary before these homes will be protected, and vigorous educational measures will have to be taken before the malaria rate can be greatly diminished.

TABLE 2

Malaria Surveys of Communities, Lake County, 1928 and 1929

District	Year	Homes examined	Homes well screened	Homes papered	Homes having cracks in walls, etc.	Homes containing A. quadrimaculatus	Average number female quads per house	Number of blood specimens	Blood specimens Positive
Cottonwood	1928	15	1	0	?	87%	14	83	40%
	1929	24	17	4	17	88%	7	119	33%
Hathaway	1928	8	?	0	?	63%	?	56	18%
	1929	10	10	3	4	50%	2	51	10%
Madie	1928	20	?	0	?	20%	?	108	15%
	1929	15	14	?	?	40%	2	103	10%

Henning Farm.—This farm in Lauderdale County was entirely screened in 1928, but complete mosquito-proofing of the houses was not finished until October, 1929. It was found this year that the screens had not been well cared for, although this could be enforced by the farm manager. Dr. R. B. Griffin, the County Health Officer, carried on a vigorous treatment campaign on this farm in the summer and autumn of 1928, and the farm manager reports that practically no time was lost by the farm hands during the cotton picking that year. A blood survey of the tenants in August, 1928, gave 22 per cent positive for malaria. A second survey on May 30, 1929, gave only 5.6 per cent positive, but a third survey on November 25, 1929, again showed 18.4 per cent positive. The normal seasonal variation apparently accounts for the spring drop. The screening and treatment has so far not materially affected the incidence of malaria on the farm. The complete mosquito-proofing which has just been completed should show its value next year. Educational measures on the use and preservation of screens will be carried out and energetic treatment will be continued during 1930.

SCHOOL SURVEYS

A total of over 22,000 blood specimens were collected in the school surveys in West Tennessee this year. The examination of the specimens from Obion, Lauderdale and Shelby Counties has not yet been finished. The results from Lake, Dyer and Tipton Counties are as follows:

Lake County.—Four school blood surveys have now been taken in this County, and the results are shown in *Table III*. The result of the 1929 summer survey corroborates the general impression that there has been more malaria in West Tennessee this year than there was last year. As was to be expected, the screening campaign in Lake County has not as yet affected the amount of malaria there, since most of the houses are poorly constructed and must be mosquito-proofed by papering and other measures before they will protect the inhabitants.

TABLE 3

Lake County School Blood Surveys, 1928 and 1929

Date	Number of Schools	Number of Specimens	Number Positive	Per Cent Positive
March, 1928	22	905	101	11.1
September, 1928	23	843	116	13.8
April, 1929	14	874	48	5.5*
September, 1929	21	952	159	16.6

*This is probably not representative of the whole county since several of the schools showing higher percentages were not in session because of the flood.

Dyer County.—School blood surveys in this County were taken in March and August of this year. *Table IV* shows the results of the two surveys. The spring survey is not representative of the whole County, since the schools with highest malaria incidence were not in session because of the flood. The fact that the summer survey of these same schools yielded 14.7 per cent positive bloods indicates that the malaria problem is by no means confined to the actual bottom-land. The high figure of 32.3 per cent positive in the bottom-land schools emphasizes the severity of the problem there and indicates that Dyer County has the most serious malaria problem in the State. This County, consisting of both bottom-land and hill country, has a total blood rate as high as Lake County, which consists only of bottom-land; and the bottom-land of Dyer County has an incidence nearly twice that of Lake County. *Map I* shows the location of the schools, their malaria incidence and their relation to the area actually submerged at the height of the flood this year. Since about 20 per cent of the population of the County live in the bottom-land, there is ample reason for instituting vigorous measures to control the disease.

Tipton County.—A blood survey of 28 schools was made in August, 1929, for the purpose of getting a preliminary estimate of the severity of the malaria problem. This County has only a narrow strip of bottom-land along the Mississippi River, and is separated from Lauderdale County on the north by the Hatchie River, whose valley is subject to overflow when the Mississippi is in flood. Out of 1,895 blood specimens taken in the survey, 138, or 6.7 per cent, were positive for malaria. Nineteen schools

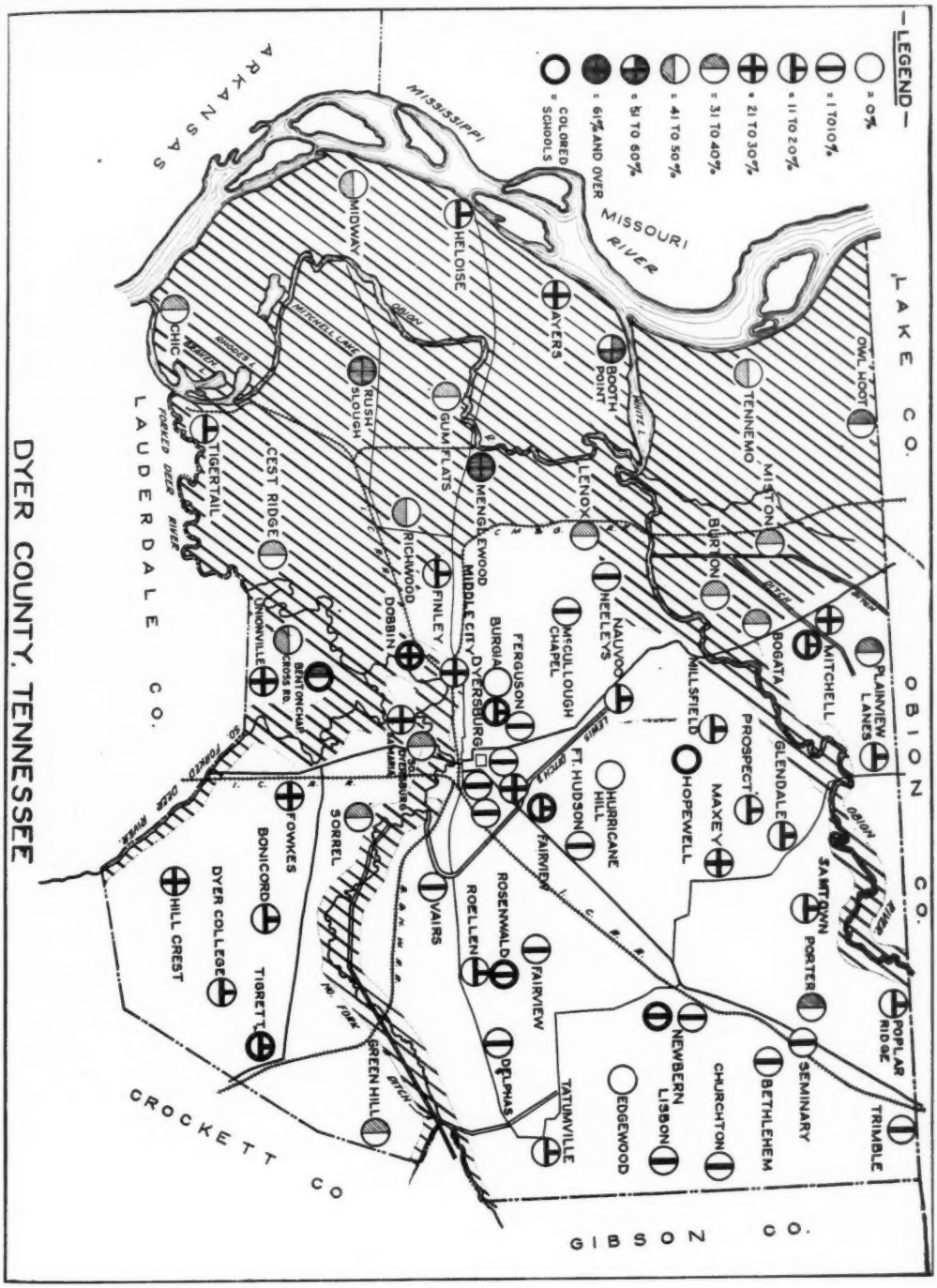
TABLE 4

Dyer County School Blood Surveys, 1929

Date of Survey Week of	Number of Schools Surveyed	Number of Specimens	Number Positive	Per Cent Positive	Comment
March 18	55	3775	253	6.7	17 Bottom-land schools were not in session
August 26	55	3642	534	14.7	Same schools as were surveyed in March
August 26	17	480	168	32.3	Schools which were not in session during March survey.
August 26	72	4122	702	17.0	All schools

MAP 1

Results of the school blood survey made in Dyer County in August, 1929. The shaded portion of the County is the land overflowed by the Mississippi River at the height of the flood in May, 1929.



MAP 1

Results of the school blood survey made in Dyer County in August, 1929. The shaded portion of the County is the land overflowed by the Mississippi River at the height of the flood in May, 1929.

showed an incidence of 10 per cent or under. Eight had an incidence between 11 and 20 per cent and one an incidence of 41 per cent. Those with an incidence above 10 per cent were all close to the Mississippi or Hatchie River. The survey indicates that Tipton County has a much less serious malaria problem than counties with a larger area of bottom-land.

Acknowledgment.—The authors wish again to express appreciation of the cooperation of the many persons who have taken part in this study, particularly to Mr. J. A. LePrince, Mr. H. A. Johnson and other members of the United States Public Health Service, to the county health officers in the counties studied, and to the staff of the Dyersburg malaria laboratory.

SUMMARY

(1) In the study of malaria in West Tennessee in 1929, Dyer County was made the center of activity. Observations were made on the rise and fall of flood water, the extent of Anopheles breeding places, the incidence of Anopheles adults and larvae, and the amount of malaria in certain communities.

(2) The results are given of school surveys in Lake, Dyer and Tipton Counties and of community surveys in Lake and Lauderdale Counties.

(3) Dyer County appears to have the most serious malaria problem in Tennessee with a positive blood incidence in the summer school survey of 17 per cent for the entire County and 32 per cent for the schools in the bottom-land.

(4) The largest numbers of *quadrimaculatus* adults appeared about the middle of June in the bottom-land and two weeks later in the hill country.

(5) There was a dramatic decrease of adults in the bottom-land at the beginning of August following the greatest heat of the summer and a period of drought, but in the hill country there was an increase of adults during August.

(6) Lake County has a positive school blood incidence of 16.6 per cent for September, 1929, as against 13.8 per cent for 1928. Community surveys show about the same amount of malaria as in 1928.

(7) Tipton County, surveyed for the first time, has a positive school blood incidence of 6.7 per cent.

REFERENCES

1. Meleney, H. E.; Bishop, E. L.; and Roberts, F. L.: Observations on the Malaria Problem of West Tennessee. S.M.J., 22:382, 1929.
2. LePrince, J. A.; and Johnson, H. A.: Unpublished work.

REPORT OF A MALARIA SURVEY AND CONTROL METHODS ON LAKE MURRAY, COLUMBIA, S. C.*

By L. T. Coggeshall, M.D.,†
Columbia, S. C.

Within recent years the recognition of malaria incidence and control of malaria about impounded waters has been a study of extreme interest and importance. The controllers of the public utilities who are now taking over the control of malaria, on and about their own properties, invariably wish to know what is expected from them by public health officials. How can they properly conduct a preliminary survey of the existing malaria incidence, the procedure of control, what results they can expect, and the cost? This paper is being presented with the hope that it will help to answer some of the queries.

Lake Murray, is a hydro-electric development, situated 16 miles west of Columbia, S. C., on the Saluda River. The area of the lake bed when full will be 75 square miles and it has a drainage area of 2,396 square miles. Its shore line will be approximately 540 miles in length. The water is impounded by an earthen dam which will be the largest in the world for hydro-electric developments. Its dimensions are: one and five-eighths miles in length, 2,000 feet wide at the base, 45 feet wide at the top and its greatest height is 208 feet above the river.

When this development became a certainty in January, 1927, the South Carolina State Board of Health requested that a survey be made to determine the amount of malaria existing before the water was impounded, or clearing of the area had begun. This was done through the cooperation of the International Health Board, South Carolina State Board of Health, and the Lexington Water Power Company. The field work was supervised by a man from the International Health Board assisted by two medical students and an engineer who were paid by the Power Company, all being directed by the State Board of Health.

The main objects of the survey were as follows:

---

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†Malariologist, Associated Gas and Electric Company.

(1) To determine the amount of existing malaria.

(2) To outline the malaria problem.

(3) To determine the proper procedure of practical control for this particular area.

The program of the work was carried out in the following manner:

(1) *Blood Smears.*—Every individual both white and colored living in the area which extended from the river bed to one and one-half miles above the proposed high water level was asked for a blood smear. There were 4365 individual smears obtained and sent to the Field Laboratory of the International Health Board at Edenton, North Carolina, where they were examined for parasites.

(2) A malaria census was taken on 1,082 families or 5825 individuals. Questions were asked and noted concerning: the location; owners of land; occupant; race; length of occupancy; previous residence; number in family; screening; cases of malaria in the past.

(3) *Anopheles Mosquito Investigation.*—This included a detailed search for breeding areas of the Anopheles mosquito and a corresponding adult catch in and under houses, porches, animal sheds, privies, bridges, and hollow trees. Along with this information, information was collected as to the type of breeding area, its permanency, and physical characteristics of the water.

(4) *Splenic Index.*—Examinations were made to determine the splenic index of male children up to 16 years of age and female children to 12 years of age.

(5) *Screening.*—All houses were classified as to whether they were screened or not, and the apparent effectiveness of the screening.

RESULTS

(1) *Smears.*—Blood smears were taken on 4,365 individuals, during the months of July to September inclusive, 1927, and only four were shown to be positive for tertian malaria. The number of smears represents 71.1 per cent of the total individuals on which histories were taken and 54.2 per cent of the total population living within the area at that time.

During the summer months of 1928 the examination of blood smears was resumed but only on those individuals giving possibly positive histories of malaria. A total of 506 smears were taken, showing eight positive, seven tertian, and one quartan. Every one of these positive smears were from persons coming in from outside the area and not from the local inhabitants. A record of all sick cases reporting to the emergency hospital showing the number diagnosed as clinical malaria is given herewith:

1928	Cases	Malaria
January	33	0
February	39	0
March	46	0
April	53	0
May	98	0
June	74	1
July	95	0
August	89	1
Total	527	2

The same plan was followed in 1929 as in 1928, that is, of examining only individuals who gave a history suggestive of malaria. Any accurate follow-up and check of the population now was almost impossible because of its transient character. Smears were taken on 98 individuals showing only four positive tertian slides.

(2) *Histories.*—A complete malaria history was obtained on 5825 individuals, which included 1,082 families. There were 803 white families and 279 negro families. The histories showed that 262 families had a positive malaria history, and they were almost equally divided among the white and the colored residents. An interesting fact was noted that over 85 per cent of the people had malaria twenty years before, but that less than 0:05 per cent had malaria in the preceding two years.

(3) *Splenic Index.*—Of the 287 children examined for enlarged spleens only an occasional one had a spleen palpable except on deep inspiration. If the premise is accepted that an enlarged spleen is an index to the amount of existing malaria this bit of information coincides with the blood findings.

(4) *Mosquito Investigation.*—A detailed search was made of anopheline larvae and adults. Only third and fourth stage larvae were collected because the lack of suitable space and facilities for care prevented us from rearing the first and second instars. No attempts were made to identify the larvae in the field. The following types of places were dipped for anopheline mosquito larvae: river, streams, pools, ponds, wells, ditches, dumps, and borrow pits. Two hundred and fifty-four separate areas were dipped for anopheline larvae. Many of these places were investigated several times, in all making 320

areas were dipped during the summer. In rearing mosquitoes, 350 female *Anopheles punctipennis* and 326 male *punctipennis* were hatched; six male *quadrimaculatus* and ten female *quadrimaculatus* were hatched. No *crucians* were reared from the area. The *Anopheles quadrimaculatus* came from two ponds and two pools respectively.

In the adult catching stations, 389 separate places were visited with the following findings: *punctipennis*, 274 females, 49 males; *quadrimaculatus*, 29 females and three males; *crucians*, three females; making a total of 358 anopheline mosquitoes for the summer.

The first *Anopheles quadrimaculatus* was found July 14 and all of the *Anopheles quadrimaculatus* found later were at widely separate intervals throughout the four counties. *Crucians* were not found until after August 21. During the month of July it rained 18 days out of the first 21, completely washing out all streams and undoubtedly retarding the normal *Anopheles quadrimaculatus* production.

(5) *Screening.*—Observations were made upon the screening of houses. Families having screened houses numbered 428, or 40.3 per cent of the total number of houses. Of the houses screened, 420 were white families, or 53.6 per cent of the total. Eight negro families had their houses screened or 3 per cent of the total.

CONCLUSION

All these findings substantiated the belief that for this particular area the malaria incidence was very low, but that due to the radical changes in the physical characteristics of the land, also that this particular section although relatively free from malaria lies on the border of a heavily infested area, it should be very carefully checked and controlled.

During the summer of 1928 the construction of the dam was still in progress and the water was not yet impounded. The work for this period of time can be briefly summarized by stating that all efforts were made to prevent malaria from coming into the area by infected carriers from outside sources. All proven or suspected cases were treated or expelled from the area.

The standard treatment was used at the expense of the Power Company.

Further studies were made to determine the prevalence of malaria among the native inhabitants, and these findings substantiated by those of the previous summer.

Control work was kept up about the construction camps throughout the summer.

COST OF THE SURVEY AND CLEARING

The cost of the first summer's work or the initial survey was $2,500.00. For the summer of 1928 it was approximately $1,000.00. This included salaries, maintenance, transportation and supplies. The cost of clearing the land in compliance with the State Board of Health regulations was approximately $2,500,000.00.

CONTROL METHODS

The impounding of the water was not started until September 1, 1929, and no mosquito breeding was discovered in the lake as late as October 1, when the work ceased.

The control program on this particular lake will be considered along the following lines:

(1) Application of oil mixtures and Paris green for larval control.

(2) Treating of all malaria cases present.

The oiling equipment devised and tested, is a centrifugal trench marine water pump the intake of which is connected to an ordinary steel oil drum. This unit is mounted on the bottom of an 18 foot boat which is propelled by an outboard 16 horsepower motor. The pump will throw a stream of water one-half inch in diameter 100 feet. Into the intake of this pump the oil mixture consisting of kerosene, black oil (heavy) and paraffin oil mixed in the following proportions 50:30:20 is introduced, and the oil is thoroughly mixed with the water before it is thrown from the pump.

This unit will use one part of oil to 120 parts of water, which can be varied with a regulatory valve. The standard steel drum, 52 gallons full of oil, will last one-half day mixed in the proper proportions for larvicidal effect. The boat in active use will probably oil 68 miles of shore line per hour.

The advantages of this unit is that the oil mixed with water is thrown with sufficient force to penetrate and break up all masses of floatage and vegetation. It covers the area to be controlled more effectively with a uniform coating of oil and consumes less time.

Paris green is applied by the method devised by LePrince, namely, the electric generator and the hand blower.

DISCUSSION (*Abstract*)

Mr. A. E. Legare, Columbia, S. C.—Next summer and the following summers, through the cooperation of the Power Company, the State Board of Health is going to establish what you might call scholarships, taking the outstanding men of the three universities, boys going into sanitary work, and give them jobs with a minor salary on malaria control work. We shall get one man from the medical college who intends to go into public health work, and in that way three or four men will become interested in malaria control work.

I mention this because it may be a suggestion for other states to obtain the same cooperation from power companies.

Mr. E. L. Filby, Jacksonville, Fla.—We have near Tallahassee on the Ochlockonee River a small impounded water project known as the Jackson Bluff Hydro-electric Development. The pond created will cover approximately 20 square miles and will have 133 miles of shore line.

In 1927, before any work was done upon this project we went over the area within a mile of the proposed shore line, taking histories and thin smears from persons living along this area. We followed this later by taking several hundred thick smears. In 1928 and '29, we repeated this house to house, person to person canvas, taking histories and smears, and now as the project is about completed we hope to give you next year a complete picture of the project from the start until the work is completed by the Power Company.

The most complicated thing in impounded water projects, I believe, is the labor which is used not only by the Power Company but by one hundred and one little saw mill companies which contract to take out the timber. These mill outfits are in no way connected with the Power Company, except that they have a small contract. Also in some cases the timber rights are not owned by the Power Company and private owners work the timber out before selling the overflow land to the Company.

I think we should work with the Federal Power Commission to the effect that any labor used on these projects whether for lumbering or dam construction should be kept as much as possible under control relative to malaria parasites. We can then prevent the importation of a great number of persons who without treatment would infect our population.

In the Ochlockonee case the timber rights were largely owned by another company separate and distinct from the Power Company. Again some of the private owners of the swamp took out their own timber through private logging operations. While it is possible to regulate the control of malaria with regard to impounded water we do not feel it possible to regulate the control of malaria in timber operations of which we have many thousands in the State.

Mr. Legare.—We recognized that the small saw mills were a danger, so the Power Company instructed all its foremen that upon the slightest indication that any man was sick he must immediately be sent to the hospital, and they took the precaution to see that he got to the company hospital. In that way we stopped any beginning of malaria spread in the neighborhood.

The neighborhood of this project is remarkably free from malaria and of course we are anxious not to have any increase, and the Company is exceedingly anxious.

Dr. A. T. McCormack, Louisville, Ky.—Some time ago the South Carolina Legislature passed regulations recommended by the State Board of Health for all impounded waters, whether a fish pond or a Power Company lake, extending for 500 miles. The power companies have also had experience with law suits in which they have lost millions of dollars; consequently, they are desirous of having the assistance of any one who will keep malaria out of their ponds.

Just 25 miles across the Broad River where they had the dam they had a tremendous amount of litigation. Lawyers and doctors were kept busy giving expert testimony on both sides and it was a lucrative business for them, and disastrous for the power company.

I would suggest that the states which have not already done so, adopt as a law the legislation recommended by the U. S. Public Health Service for the areas where waters will be impounded.

Dr. T. H. D. Griffitts, Albany, Ga.—Georgia was one of the earliest States to adopt comprehensive regulations on impounded waters, and these regulations are effectively applied by the Georgia State Board of Health through commendable cooperation on the part of power companies.

Mr. M. L. Clarkson, Atlanta, Ga.—The preliminary work of blood examination is not included in any of the regulations of the State of Georgia and is in no way connected with the regulations. This preliminary investigation is entirely separate and distinct from the State Board of Health regulations.

RECENT OBSERVATIONS ON MALARIA AND ANOPHELES IN THE PHILIPPINES*

By W. V. KING, PH.D.,
Mound, La.

A recent trip to the Philippines under the auspices of the International Health Division of the Rockefeller Foundation was arranged primarily for a taxonomic study of the local species of Anopheles, the classification of which has been much confused. The more technical side of the work has not as yet been completed, but at this time I should like to bring to your attention very briefly a few general observations on the occurrence of malaria and its carriers in the Islands.

To one accustomed to a close association of malaria with low swamp lands the most striking feature of the situation there is the unusual distribution of the disease. On the Island of Luzon, to which my observations were limited, malaria is pre-eminently a disease of the foot-

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

*From the United States Bureau of Entomology.

hills and rolling lands and, strange to say, is decidedly less important in the typical lowlands.

Although generally hilly and mountainous, the Island contains a broad central plain extending north from Manila Bay to Lingayen Gulf, a distance of some 95 miles. In the immediate vincinity of Manila are numerous fishponds, salt evaporation beds, tidal streams and some salt marshes, the latter becoming more extensive around the north shore of the Bay. Continuous with this low coastal area is a rich alluvial plain extending through parts of the provinces of Bulucan, Pampanga, Neuva Ecija, Tarlac and Pangasinan, a considerable part of which is devoted to the growing of rice. This area is well populated and is the center of rice culture in the Archipelago.

The City of Manila and its suburbs are said to be almost free of malaria, and this is also true of a number of villages and rural communities in the rice-growing sections in which surveys have been made. The low malaria rate in much of the area cannot be attributed to the absence of Anopheles since favorable breeding conditions for a number of species exist throughout, as might be expected from the topography and the character of its principal crop. In addition to the flooded rice fields there are sloughs and roadside ditches, pools and quiet backwaters in the river beds, in which larvae are invariably found. The fishponds about Manila are especially prolific sources of a salt-water-breeding species and an extensive fresh water swamp in the eastern part of Pampanga Province is presumably favorable for other species, although we made no collections there. The most obvious explanation of the relative scarcity of malaria under such conditions is that the common species, fortunately, are not effective carriers. The residents themselves are evidently sufficiently exposed, since screens are not in use at all and the usual dwelling is a loosely constructed nipa house.

In contrast to the above are the high malaria rates found in the rolling lands and foothills at the border of this plain and in many other parts of the Island. From the epidemiological and other evidence which has been collected this situation points very strongly to the importance as a carrier of a single species out of the 20 or more which occur on the Island. This species is *Anopheles minimus,* a stream breeder which is found typically in small, well-shaded streams of clear running water. Such streams are abundant throughout the hills. It is rarely taken in standing water away from the current or at the edge of the rivers after they widen out in the plain. It does, however, breed to some extent in the grassy margins of irrigation canals and in ditches which are led through some of the villages to supply water for household use. Certain malarious centers which are not confined to the hills have been attributed to the latter.

The probable connection of *minimus* with malaria transmission in the Philippines was first brought out by Walker and Barber (1914), who found it the most susceptible to laboratory infection of five species with which they worked. Barber, Raquel, Guzman and Rosa (1915) added epidemiological evidence in support of its being the principal carrier under natural conditions. These observations have been confirmed and extended by the International Health Division and the Philippine Health Service, whose records show the presence of *minimus* in nearly all malarious places (Manalang, 1928). Manalang also gives the results of the dissection of *Anopheles* from one locality, of which 19 *minimus* were positive out of 2,283 dissected as against no positives among 410 specimens of eight other species.

Of the numerous species occurring on the Island of Luzon probably less than half become abundant enough to be considered of possible importance. All, or nearly all, of the common forms, however, have at one time or another, either in the Philippines or elsewhere, been proven susceptible in varying degrees to laboratory infection. As in other countries, the blood-feeding habits of susceptible species play an important part in their relation to malaria transmission. A species of particular interest in this connection is the salt-water form of *Anopheles ludlowi* which is produced about the suburbs of Manila in enormous numbers from the fishponds and salt evaporation beds, without giving evidence of maintaining the disease among the residents in the immediate vicinity. Curiously enough, the species given the same name in Sumatra and Java is considered to be the principal carrier in that region. As to the Philippine form, it has not been determined whether feeding habits, susceptibility, or a combination of the two, is the deciding factor, and the same statement may be applied to two other closely related and widely distributed species, *Anopheles subpictus* and *A. vagus.*

Another species, *Anopheles maculatus*, thought to be a good carrier in other countries, occurs in the Philippines and becomes abundant in the mountains and higher foothills. Its definite relation to malaria has not as yet been established, but it may prove to be of importance in those areas where it predominates.

One of the difficulties encountered in attempting to obtain comparative records of the abundance of different species, in order to correlate it with malaria incidence, is the wild nature of most of the local forms: that is, they do not ordinarily remain about the houses and stables during the daytime. This is especially true of *minimus* whose customary retreat has not as yet been discovered. Certain other species are more often found in the buildings, but almost never to the same extent, I think, as with a species such as *A. quadrimaculatus*.

Two of the methods used by mosquito catchers in obtaining specimens for dissection and other records are personal exposure out of doors after dark and collections in the vicinity of animal quarters at night. On one occasion Mr. Mieldazis and I visited a carabao pen shortly before daylight. Here, by means of flashlights, we found freshly engorged females of several species (mostly *minimus*) hanging from the grass blades and fence posts. Just at daybreak, at the time when our own *quadrimaculatus* would begin to move into shelters, these specimens disappeared, but we were unable to trace their flight and could find none afterwards in a shed and two nipa houses near by. Of many collections made by various workers only a few instances are recorded in which *minimus* was found naturally inside buildings.

Another feature of the malaria situation on the Island of Luzon is its seasonal distribution, and this also has been accounted for by the habits of *minimus* and the effects of meteorological conditions on its breeding places. The west and central portions of the main part of the Island have distinct wet and dry seasons, the heavy annual rainfall occurring mostly in four or five of the midsummer months. The torrential rains are said to have the effect of flushing out the small streams so that breeding of *minimus* is generally much reduced during these months. As a result, instead of coinciding with or closely following the rainy season, the peak of malaria incidence as indicated by the records available occurs normally during the dry season. (Tiedeman, 1927; Parsons, 1928, and J. J. Mieldazis, personal communication). This again is in contrast to conditions in many other parts of the world.

The relatively restricted breeding places of *minimus* have made it feasible to undertake control in favorable localities with Paris green dusting. Early experiments along this line by Tiedeman (1927) and similar efforts by the Army Medical Corps in the control of malaria at Camp Stotsenburg (Parsons, 1928) gave results of considerable promise and the work has now been expanded into a number of control units in various parts of the Islands. There are many questions yet to be settled as to the part played by other species, but at the present time the control efforts are limited to the treatment of streams. The experience so far seems to justify this procedure, especially in view of the fact that the operations can cover only a small proportion of the active foci. A careful analysis of the results over a short period of years will undoubtedly give evidence of much value for the guidance of further work.

I previously mentioned the fact that *Anopheles minimus* breeds at the grassy edges of irrigation canals. While traveling through the main rice-growing sections of Bulucan and Neuva Ecija Provinces I noticed a number of new irrigation projects under way. As this will make possible the cultivation of rice during the dry season, it seems likely that the system of canals and ditches will be gradually extended. If so, it will be of much interest to note the future trend of malaria in areas now comparatively free and a possible increase of the disease as a direct result of agricultural development.

REFERENCES

1. Walker, E. L.; and Barber, M. A.: Malaria in the Philippine Islands. Phil. Jour. Sci., 9:381-349, 1914.
2. Barber, M. A.; Raquel, A.; Guzman, A.; and Rosa, A. P.: Malaria in the Philippine Islands. Phil. Jour. Sci., 10:177-245, 1915.
3. Tiedeman, W. D.: Malaria in the Philippines. Jour. Prev. Med., 1:205-252, 1927.
4. Parsons, A. L.: Malaria Control at Camp Stotsenburg, P. I. Military Surg., 51:816-829, 1928.
5. Manalang, C.: Notes on Malaria Transmission. Phil. Jour. Sci., 36:123-129, 1928.

DISCUSSION (*Abstract*)

Dr. Jacob Fajardo, Manila, P. I.—From time immemorial malaria has been so well known that its usage in diagnosis has become vulgar. Instances are known where cases diagnosed as malaria have been found to be otherwise upon pathological or hematological examination. Reports of malaria deaths have, therefore, been exaggerated and the exaggeration is excusable when the extensive practice of not seeking medical attendance is considered. Unqualified men often make the diag-

nosis, and since the chill and fever of malaria are well known among the laity and illiterates, other diseases with allied manifestations are often branded as malaria.

That malaria is rampant in distinct regions and not in all the Philippines is an established fact. Investigations and studies of malaria in the Philippines have been done by renowned workers. As early as 1909, Nicols associated the disease with streams. In 1914 and 1915, Barbour and Walker, after experimental infection studies incriminated *Anopheles febrifer* (Banks), and *A. minimus* (Theobald), as the transmitters of malaria in the Philippines. In 1922 and 1924 representatives of the Rockefeller Foundation, after surveys and studies, arrived at the conclusion that the two species *A. minimus* and *A. ludlowii* (Theobald) are the most dangerous carriers of malaria, and that practical malaria control would have to take the form of mosquito control, using Paris green as the cheapest larvicide. From 1924 to the early part of 1926 these representatives continued their demonstrations of malaria control and advocated Paris green as an effective and cheap larvicide in the control of malaria.

In November, 1925, the Malaria Division was created in the Philippine Health Service and 50 per cent of the expenses for the purchase of the necessary equipment, supplies and salaries were paid by the Rockefeller Foundation as aid in the campaign. In 1927 the Philippine Legislature appropriated 100,000 pesos for malaria control and five units were organized, consisting of one physician, one field director, and several laborers, the number depending upon the control areas.

In the early part of 1927, after the completion of necessary surveys in Mindanao, Dr. Ma, Chief of the Malaria Division, reported that in a survey of 69 malarious places in Luzon and Mindanao, *A. minimus*, a stream breeder, was found in 64, or 93 per cent, of the places, and was the predominant species in 53, or 77 per cent. It is believed that if larval collections had been made during the malaria seasons in all those places *A. minimus* would probably be found in almost all as the predominant species. There may be a few locations where *A. minimus* is not the natural vector, but this remains to be shown by further studies or observations. In a survey of 25 places in Mindanao and Sulu, where malaria was present, *A. minimus* was always found, alone or with the other species, while when *A. minimus* or its potential breeding places was absent, the other species present or abundant, there was invariably no malaria. Of course the presence of *A. minimus* does not necessarily imply the presence of malaria.

Dissections of Anopheles mosquitoes were begun on September 1, 1927, and by December 31, 1927, there were dissected 2,589 anopheline mosquitoes. Of this total, 2,283 *A. minimus* were dissected; and there were found 19 positive stomachs and eight positive salivary glands. The rest were mosquitoes belonging to other species. None of these were found infected. In 1928, 24,148 anopheline mosquitoes were dissected, of which 9,879 were *A. minimus*. Of these latter 142 had positive stomachs and 104 had positive salivary glands. In 1929, up to July, inclusive, 20,153 anopheline mosquitoes were dissected. Of these, 6,283 were *A. minimus* with 14 positive stomachs and eight positive salivary glands.

Our malaria control consists of anti-anopheles operations, using Paris green as a larvicide, and human control through free distribution of quinine and plasmochin compound in malarious provinces for the extensive treatment of malaria cases and carriers. Plasmochin compound has been extensively used at the San Lazaro Hospital of the Philippine Health Service and in the field. The experiments have brought out identical conclusions, to the effect that plasmochin compound is an effective medicine in the treatment of malaria cases and its effect is particularly more marked on the gametocyte carriers.

Dr. V. G. Heiser, New York, N. Y.—The paper of Dr. King is an additional illustration of the great desirability and, in fact, necessity, for defining the malaria problem before beginning any large scale control measures.

In 1921, when General Wood became Governor of the Philippines, he looked over the annual deaths and found some 30,000 were charged to malaria. He was always keenly interested in the control of preventable diseases. His humanitarianism was aroused and he offered to provide a half million dollars and asked me to suggest plans. He was greatly disappointed when field studies were proposed as the first step. He felt that drainage of swamps more befitted a man of action. In the light of the knowledge developed we know now that if the entire sum had been spent on the basis of then existing knowledge that it probably would not have reduced malaria very much.

As pointed out in Dr. King's paper, no malaria originates in the lowlands in the Philippines; it is contracted in the foothills. Strange to say, the great valleys of the Philippines are practically free from malaria. With the knowledge now available there is some hope that malaria can be controlled within a reasonable cost, though up to this time the cost is close to 50 cents per capita, which is too high for Philippine conditions. It is well to recall that there is no frost and the Anopheles can be active the whole twelve months; while in the United States they are active only about one-half of that time. It will be apparent, however, that the cost of control is much lower than in this Country. If malaria control in the Philippines is to be undertaken on a large scale, cheaper methods must be found than those which are used at the present time.

Army medical officers, after struggling for more than 25 years in attempting to control malaria at Camp Stotsenberg with the resources of a United States Treasury behind them, are only now in a position to deal with the situation effectively because they have the knowledge on which to act.

In conclusion, I wish to emphasize how necessary it is before we begin malaria control that the problem be definitely defined, not only by counties and states, but in the local area. The enemy's position must be disclosed before the attack is begun.

MALARIA IN PORTO RICO IN ITS RELATION TO THE CULTIVATION OF SUGAR CANE*

By W. C. EARLE,
New York, N. Y.

It is commonly believed in Porto Rico that as long as sugar cane is grown there very little can be done to control malaria. Since malaria is one of the more serious health problems and the sugar cane industry one of the principal sources of revenue to the Island as well as one in which large sums of money are invested, a careful study of the relation of the cultivation of sugar cane to the malaria problem is very important. There are three factors to be considered, namely: the Anopheles mosquitoes, the population affected by malaria, and sugar cane, particularly its methods of cultivation.

Three species of Anopheles mosquitoes are found in Porto Rico, but in all probability only one of them, *Anopheles albimanus*, is of any great importance. The adaptation of *A. albimanus* to varied conditions, however, makes the problem as difficult as though there were two or three species which were vectors. It may be found breeding anywhere on the Island from the mountains to the seashore, in fresh or brackish water, stagnant ponds or flowing streams. Epidemics have resulted from breeding under any one of the above conditions, but the usual endemic state is maintained by mosquitoes breeding under a combination of all conditions. This mosquito breeds only occasionally in artificial containers, such as barrels and tin cans. Water deposits most favorable for its development are abundant in the coastal region and since the temperature there averages 76° for the year and never below 60°, breeding takes place all the year round.

Porto Rico is densely populated and there are numerous towns, the largest with a population of 100,000. In the coastal regions these towns are often surrounded by sugar cane plantations. Labor colonies are scattered throughout them and villages may be located on the narrow beach, between the arable lands and the ocean. In other regions a scattered rural population is found from the ocean to the mountains.

Malaria is not uniformly distributed throughout the population, but is mainly of significance on the coast. (Mountain: spleen rate 9.2, parasite rate 5.4. Coast: spleen rate between 11 and 56, parasite rate between 16 and 55.) While some variety of sugar cane is found growing in practically all parts of the Island, it is mainly grown on the coastal plain, and it is therefore reasonable that malaria and sugar cane should be associated in the minds of the people and attempts made to prohibit the planting of cane about towns in order to reduce malaria incidence. Sugar cane, however, is extensively grown in certain hilly sections where malaria is not a problem (region of Guajataca Reservoir: spleen rate 6, parasite rate 5.0); and in the coastal region there are other causes than those associated with its cultivation, for malaria is often severe where little or no cane is raised. (Humacao Beach village: spleen rate 56, parasite rate 55.) An analysis of the factors will show that cultivation of sugar cane, while usually constituting an important factor in maintaining a fair degree of endemicity, occasionally may tend to alleviate conditions, and that when done with proper care it need not be a factor at all in maintaining a high density of Anopheles mosquitoes. In view of the fact that an attempt is made to grow sugar cane over the greater portion of the coast of Porto Rico, even down to within a very short distance of the ocean, an enormous influence can be exerted on the incidence of malaria by removing this entire cane area as a source of Anopheles mosquitoes.

Conditions vary greatly in different parts of this area both as to rainfall and effectiveness of drainage systems. There is practically no portion that does not receive sufficient rain, along with other factors, to produce conditions favorable for transmission of malaria, so that it is probably more convenient to disregard rainfall and to divide the cane region into:

(1) The lowlands more or less at tide level

(2) The higher lands with tight soil and poor natural drainage

(3) Seepage areas

(4) Irrigated lands

In their natural state these lowlands are covered by mangrove trees, reeds, or grasses; which type of vegetation predominates depends upon the salt content of the water. Extensive inroads have been made into these swamps by

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

*The studies and observations on which this paper is based were conducted with the support and under the auspices of the International Health Division of the Rockefeller Foundation.

cane planters. The ground is banked to get the plants out of water and, as the banks may be only 4 feet wide, with ditches in between, it can readily be seen that not only is a large proportion of land lost in ditching, but also the potential breeding area for Anopheles mosquitoes is rendered enormous. It is impossible to keep the ditches clean enough to prevent mosquito breeding and the area is often too large compared with the population protected, for the practical application of Paris green. In those lowlands which collect water from tides, floods, or heavy rains only, a great deal has been done by the use of automatic tide gates, both in the reclamation of lands for agricultural purposes and for mosquito control. These gates are of little value where water is being constantly poured into lowlands from springs or irrigation systems, because the difference in tide level is small and the time available for draining the lowland is short. These as well as many other areas below tide level must be drained by pumps. Pump drainage for mosquito control alone is being done about San Juan, the largest city of the Island, and arrangements have been made recently on the south coast to obtain assistance from the Irrigation Service for pump drainage of some of the worst swamps there. In most regions this type of drainage is too expensive as an anti-mosquito measure alone, and control of mosquitoes will have to wait until the area has been reclaimed for agricultural purposes. In most cases this means for the planting of sugar cane. Pump drainage already installed has tended to alleviate conditions, for observations have definitely shown that very little breeding takes place in swamp areas which are effectively drained by pumps and planted with cane. Increasing interest in this type of drainage makes one hopeful that in the near future conditions will be greatly improved, in many of the worst areas.

By far the greater portion of the cane lands is above tide level, at least in the most thickly populated regions. Most of these are fairly well drained, but during periods of prolonged rainy spells water may remain stagnant on the fields for varying lengths of time. When cane is germinating and also when it is still quite young, it is very sensitive to excess water, and everything possible is done to keep water from standing about the plants for more than two or three days. When the cane reaches the height of a man or higher, the shade that is produced is very unfavorable to extensive *albimanus* breeding. In these two respects the campaign against the mosquito is aided. Plantations are cut up by numerous roads and ditches and there are always some fields of half grown cane to give trouble in the rainy months. During the season for harvesting and preparation for replanting, however, drainage outlets are abandoned and the cutting of plants removes the shade which was such a great aid up to that point. On the north coast especially the soil is rather tight and the rainfall heavy. From September through December, between 5 and 20 inches of rain may fall each month, though heavy showers may come at any other time of the year as well. In most cases these areas can be kept mosquito free by careful attention to drainage outlets, yet there are times when it is impossible to do so and water remains stagnant in every depression in the ground. If the area is small, Paris green can be applied, but subsoil drainage (which will be discussed later) is a much more effective and permanent method of handling the problem.

Seepage areas constitute our worst problem, not only because of the facility of anopheline breeding in them but also because of the extensive area involved. On the north coast these are usually limited to small outcrops more or less at the base of hills, but on the south coast the water seeps out of the ground over large areas, usually within one to two miles of the ocean. At one time there were as many as 800 acres of such lands about the town of Salinas, within flight distance of Anopheles mosquitoes. In most cases the land is fertile and therefore continuously planted with cane. Narrow, shallow ditches are dug so close together that in one acre there may be more than a mile of ditch, which will breed *albimanus* very readily until the cane is high enough to produce dense shade. It is possible that the cultivation of some of these lands has made conditions more favorable for the breeding of Anopheles mosquitoes.

The problem can be handled very effectively by subsoil drainage with tile. Interest in this type of drainage has been increasing in the past eight years and results in most cases have justified the original expense. Tile drainage costs about $100 an acre, while good land is worth $500 and the crop, with average prices, may bring $300 an acre. This expenditure is soon returned in facility of cultivation, saving in ditch making and maintenance, and greater area available for planting which was previously lost in ditches. We have been interested in the instal-

lation of tile drainage primarily from the agricultural standpoint, because the benefits to agriculture are great and the rapid extension of this type of dainage over the Island will depend largely on recognition of these benefits. To stimulate interest in the more rapid extension of tile drainage in regions where malaria is particularly severe, aid has been given to property owners in a few cases. But at least half of the cost of drainage is paid by the landowner. By means of tile drainage, therefore, tight soils are made more porous and stagnation of water prevented, while in seepage areas the water is collected in the tiles before it reaches the surface of the ground.

The last region to be considered is that in which irrigation is necessary. It is estimated that 75 inches of water well distributed throughout the year are necessary for a crop of cane. On the north coast this amount of rain often falls, though it is poorly distributed throughout the year. On the south coast, only 25 to 30 inches may fall during the year, and most of this is in three or four months. Since some of the best lands are found in this region, extensive irrigation systems have been developed to make possible the raising of sugar cane.

It is extremely difficult to determine the actual importance of irrigation water in maintaining the high incidence of malaria which prevails in most of the irrigated regions, for there are always other sources of Anopheles mosquitoes as well. We do know, however, that irrigation water in its course from the reservoir to the ocean often breeds Anopheles mosquitoes in large numbers. More important still, malaria control is always much more difficult in irrigated regions and as a rule it requires a larger staff. The water for irrigation comes from a variety of sources: government reservoirs in the mountains, deep wells, or diversions of water from rivers in their courses through the plains. Reservoirs in the mountains give little trouble, for they establish a clean margin very quickly; they are at a higher altitude with a less favorable temperature, and they are not very large, so that heavy rains at certain seasons and demands for irrigation at others repeatedly cause great fluctuations in levels.

The main government channels which carry the water to the fields are usually kept clean and in good condition. It is after water is delivered to the property owners that the greatest difficulties are encountered. All canals are open and only a few are lined with impervious material, so that they soon become filled with vegetation. Leaky wooden canals are often used to carry the water over low places and small reservoirs for overnight storage become overgrown with vegetation. But there are three conditions which are particularly serious in most irrigation systems: (1) makeshift headgates which are not watertight are usually used, with the result that portions of all canals contain water most of the time, even when irrigation is not practised in any one part more often than once every two or three weeks and for only two to three days at a time. (2) Small mud dams, used to direct the flow of water into the furrows about the cane plants, are often not completely removed after irrigation, so that during the rainy months which may follow, countless pools of water of varying size are formed along the canals. (3) There are many areas in which more water is put on the ground than can be absorbed and only too often the excess water is permitted to pour over waste lands or into swamps where unusually heavy mosquito breeding may result. Conditions, bad enough in the rainy months, are thus made worse and the period of stagnant water is continued longer into the drier months.

Irrigation water can be handled quite easily, however, without breeding large numbers of mosquitoes. It is the purpose of irrigation to have the water remain about the plants for not more than two or three days, usually one day, so that there need not be any trouble in the fields themselves. Canals needing water for more than ten days to two weeks at a time must be kept clean or lined with impervious material. Usually, the number of these canals is small and if necessary Paris green can be applied occasionally. The water must be confined to regions actually being irrigated, which means, above all, the installation of watertight gates and the regulation of the flow of water in each canal in accordance with its capacity and needs. It is usually possible to arrange the routine of irrigation so that the water can be rotated from one canal to another at weekly or ten-day intervals; such intervals are too short for complete development of Anopheles mosquitoes. Then, upon terminating the irrigation of any part, or if for any reason the system is not in use, all obstruction to drainage must be removed and all canals kept free of water until the next irrigation. Last, but not least, excess irrigation water must be carried

directly to adequate drainage channels or to the ocean. In practice it usually takes several months to train the labor on a plantation to carry out these measures when a campaign is initiated, but results have generally been good and the expense to the property owner relatively low.

The relation between the cultivation of sugar cane and malaria is thus seen to be rather complicated. There are many kinds of water deposits and *Anopheles albimanus* is extremely adaptable. Soil conditions vary greatly and sugar cane is also very adaptive. Some factors in the cultivation of cane are greatly in our favor, such as the pumping of lowlands, the necessity of removal of water from fields of young plants, the shade produced by maturing plants, the great benefit to be derived from tile drainage, and the great value of the crop. Other factors are less favorable, namely, the adaptability of certain varieties of cane to conditions of excess water which breed large numbers of mosquitoes; the extensive ditching of seepage areas producing conditions very favorable for anopheline breeding; inadequate irrigation systems and handling of water, and the location of labor colonies in close proximity to inadequately drained areas. It would appear, therefore, that there is some justification for the consideration of measures tending to prohibit cultivation of cane about centers of population because of methods of cultivation which favor anopheline breeding. There are several factors, however, which argue strongly against this policy as the only choice. Because of the great expense of cultivating wet lands or of irrigating dry lands, there is at present no other crop which apparently can be readily substituted for sugar cane in these lands. The land would either lie fallow or would be used for pasture, so that conditions in some wet lands might actually become worse. The value of the land would drop, revenue to the state would be reduced, and, because of non-productiveness of the land, the owner would not be able to spend money in improving drainage for mosquito control alone. It has already been shown that it is possible to grow sugar cane in Porto Rico without producing Anopheles mosquitoes. Hence, rather than legislate against sugar cane which may be an asset to the community, the methods used in its cultivation which are harmful should be regulated. It is toward this end that new regulations are being studied.

While there are many problems in malaria control which seem almost impossible to solve at the present time, I think one should be greatly encouraged by the results of the efforts of the Department of Health in Porto Rico. The success of these efforts is due in great measure to its very capable director, Dr. Pedro N. Ortiz. The problem is not so difficult as is the plight of the unfortunate victims of advanced cancer or of tuberculosis, whom no amount of money will save at the present time. Innumerable instances in other countries have shown that malaria can be controlled under the most difficult conditions when resources are adequate, and it is encouraging now to see more and more instances of such control in communities of only average wealth. In Porto Rico, at least, municipalties and corporations can do a great deal to control malaria, by intelligent handling of water, both by drainage and irrigation, and by more careful selection of sites for labor colonies, taking particular care to place them as far as possible from breeding areas that are difficult to control.

DISCUSSION (*Abstract*)

Dr. W. E. Deeks, New York, N. Y.—I have never been in Porto Rico, but the United Fruit Company has cane plantations in Cuba under similar conditions, and our success there in the control of malaria is greater than that in our banana properties in other countries.

Cane plantations are more favorable for Anopheles breeding than banana plantations, where there is much more shade.

In our cane lands we have rivers and streams which render the general control of Anopheles breeding practically impossible. In 1926 we began malaria control in our Cuban plantations, where we were at that time hospitalizing about 400 employees annually out of every 1000 in one of the Divisions, and about 300 to 1000 in the other Division. This year we have hospitalized in one Division 37 per 1000, and 25 per 1000 in the other. We have handled our problem a little differently from the way it has been handled in Porto Rico. I hope, therefore, that Dr. Earle can visit our plantations in Cuba before he returns to Porto Rico. We do not attempt to control all Anopheles breeding throughout our Divisions, but we do carry out short-range sanitation. On the first general sanitary inspection in 1926, it was found that 75 per cent of the breeding foci in our Cuban Divisions were man-made, such as leaking water taps and railroad water tanks, borrow pits, poorly constructed ditches, hoof prints, hog wallows and imperfect drainage everywhere. Our attention has been devoted principally to the man-made Anopheles breeding places found in the immediate neighborhood of habitations.

In regard to irrigation: we do not irrigate in Cuba,

but we do in some other plantations, for example, in Jamaica we are using concrete drains and irrigating five days, and then cutting off the water for two days.

Now in regard to another point, and I would suggest this as important: we have just started it in two Divisions. We are centralizing our population. We are establishing town centers; and, where originally we had four settlements to take care of from a sanitary standpoint, we now have one. We do not attempt sanitation over 300 or 400 yards from the habitations. Another thing we do, which is working out satisfactorily, is to make every farm superintendent, overseer, and foreman in our Agricultural Department and the railroad right-of-way responsible for the control of mosquito breeding around his immediate vicinity, and we are insisting on co-operation everywhere as the rule in controlling mosquitoes. No man is allowed to have leaking water taps and open reservoirs around the habitations which he is in charge of. The railroads are compelled to take care of the sanitation of their right-of-way within half a mile of any habitation. They are responsible for its care and up-keep, and are not allowed to dig and leave open borrow pits to breed mosquitoes. Sick people are not allowed to remain in camp longer than a few days, when they are compelled to go to the hospital. In this way we have been able to control malaria in Cuba, not by widespread sanitation, but by short-radius methods within one quarter of a mile.

We have not as yet adopted screening except for the selective population of the more intelligent class, who are susceptible to malaria and who can be depended upon to keep the screening intact.

It is through eradication of those man-made breeding places in the immediate vicinity of habitations that we have effected the greatest control of the problem.

Dr. William A. Boyd, Columbia, S. C.—The conditions under which Dr. Deeks is conducting his program are radically different from those in Porto Rico. Dr. Deeks is dealing with a corporation, operating under publicity properties that he owns or controls; Dr. Earle is obliged to effect co-ordination over a wide variety of properties and dealing with individual land owners; so that the program that Dr. Deeks is developing is effective under the conditions that he has, but I do not feel that the two conditions that have been described are altogether comparable.

Dr. Herbert C. Clark, Panama.—My interest was long ago centered on eradication of malaria; my hope now is merely to suppress malaria from an economic standpoint. Eradication of malaria belongs to another generation, I am afraid.

In the six years that I have been watching labor camps, I have noticed that the contractors employ men that they know are physically unfit to perform the duties of a laborer in order to give them hospitalization. In the last two or three years we have selected the laborers better. The physical selection of labor is of great importance; and the more medical attention you can carry to the camps, the better.

I have examined men actually at work (not out of a box car) and compared them with the stay-at-homes who were in the camp when labor hours were on. The field men range about 15 per cent positive; the stay-at-homes range anywhere from 40 to 100 per cent positive.

The Madden dam up the Chagres River is connected with a road-building project of about 60 miles which will take five or six years to complete. That is calling for a large unit which is not connected with Canal Zone work, and they are put into the Chagres River Valley camps. These camps have their men leaving Saturday and returning Monday to ordinary rural villages on the banks of the river. The banks have been cleared in large areas and there is sanitation for a short range around that area. The men have been put in large screen barracks and the food is supplied and prepared. They get a studied ration and protection during the week, except during the week ends. That labor force is averaging 6 to 10 per cent positives. It is one of the best controls I have seen of a large labor force camp in compact formation.

It is a good plan to see that the men get a substantial ration three times a day. Labor left to supply its own food is not going to do that.

Dr. Dalferes P. Curry, Panama Canal Zone.—Dr. Clark did not see one thing that I saw in the camps on the Chagres River. He did not see these laborers when they were recruited; 50 per cent of them could not push a loaded wheelbarrow. We did not take many into the hospital, but we did send liquid quinine to them to be taken by those who desired it. The majority of them received almost no treatment, but they were put into the screened barracks and received excellent food. The most noticeable thing was the immediate evidence of improvement in their physical condition. They had lacked food. The American ration is different from the native ration. Under good food the men have improved until now it is the best looking crowd of native labor that can be found in the tropics. The use of screened barracks in temporary jungle labor camps has been to me a striking thing, and it is one thing I had to fight for when we planned this work. The first idea was to combat malaria with drainage and oil, but I do not think that extensive drainage would have been justifiable for a labor project that was to last only one year. To have done drainage work on anything like the scale that seemed indicated would have meant to spend as much on drainage as we would have to spend on the actual labor of grading the roads, so we compromised on screened barracks of large size. We had thought of portable camps, but they were not practicable. We gave our plan to the engineers, and sold the idea to them. Every board, every sawed timber, sheet of roofing, and roll of screen that went into the first of these buildings was carried afoot over wet jungle trails. I am glad to have Dr. Clark's endorsement; for I think that is one thing that saved the labor situation at Madden Dam and made possible road construction at a justified cost for sanitation.

MALARIA CONTROL IN HAITI*

By S. S. Cook, M.D.,†
Port-au-Prince, Haiti

Haiti with her 10,000 square miles of territory and two million people has passed through varied stages of exploiting and being exploited.

From time to time a native more intelligent and more ambitious than his countrymen has proclaimed himself emperor, king, or president as the case might be, and for a brief period has flourished and has indeed at times brought many improvements to his country. However, such periods of domination were foredoomed to failure and endured only by virtue of the frenzied applause of an ignorant populace.

It would serve no useful purpose to detail at this time Haiti's many vicissitudes at her own hands and the hands of supposedly friendly foreign powers. Suffice it to say that conditions had reached the stage in 1915 when it became necessary for the preservation of the integrity of the country that some friendly power come to her rescue. After diplomatic exchanges and the usual preliminaries a treaty was concluded with the United States in 1916 by virtue of which the United States took over the collection of customs and supervisory charge of certain other activities.

In 1919 a National Public Health Service was created by law to direct Haiti's sanitary and medical problems. This Service, under the administration of naval medical officers, has steadily grown until there are at present ten public health districts with a well equipped hospital in each. The Public Health Service now comprises five principal divisions, namely: hospitals and rural clinics, quarantine and sanitation, medical education, finance, and transportation and supplies. It was seen early in 1923 that to reach the masses it would be necessary to take treatment to them. Therefore rural clinics, as funds became available, were established in convenient locations throughout the island from Ouanaminthe in the North to Anse a Pitre in the South.

To understand the situation in Haiti it is necessary to realize that there is no middle class. There are the reasonably well educated city people on the one hand and the approximately 80 per cent of the population made up of illiterate country people on the other. To reach this 80 per cent who, through fear and timidity, seldom came to town, it was essential that they be treated in their own neighborhoods. These facts have been repeatedly stressed by Butler, Payne, Hoffman and Peterson. Through rural clinics an increasing number has been reached each year until during the fiscal year of 1928-1929 almost one and one-half million treatments were given. Malaria, yaws and intestinal parasites are the principal causes of morbidity and in the aggregate produce infinitely more suffering and non-productiveness than all the other diseases combined.

Records of the incidence of malaria in Haiti from her discovery in 1492 to 1915 are somewhat sketchy, but nevertheless in sufficient detail to indicate its high prevalence throughout this period. Several of the physicians of the French Colonial days left clinical descriptions of what is believed to have been malaria, and they refer to epidemics of fever that affected many of the colonists. Dr. Leon Audain, who began practice in Port-au-Prince in 1891, was deeply interested in tropical medicine and reported that in 1909-1910 malaria was epidemic in Port-au-Prince and in 1911-1912 published the results of his laboratory examinations in 30 positive cases, representing the first scientific laboratory work done in Haiti. Of the 30 cases, 76 per cent were malignant tertian, and this figure does not differ greatly from present-day findings. Data are available from several sources to indicate the extent and severity of the disease from the beginning of the American Occupation in 1915 to September, 1929.

Personnel of the United States Marine Corps were distributed throughout the Central, Northern and Western sections of the Island from 1915 to 1923 and naval medical officers on duty with them have published descriptions of malaria prevalence among the Marines and also in the native settlements near by. Abstracts from their published reports are cited.

Dr. Allen[1] states:

"Malaria was responsible for 16,986 sick days in the First Brigade in 1921. The average strength was 2,115; the number of admissions was 2,056. In the first six months of 1922 the number of admissions was 425. Five deaths occurred in 1921 and three so far this year."

---

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

*From the National Public Health Service of Haiti.

†Lieutenant Commander, Medical Corps, United States Navy.

[2]"From the beginning of the Occupation until recently (1923) malaria has caused the greatest number of sick days and deaths in the Marine Brigade. The Marines, in order to perform their mission in Haiti, were compelled to patrol the entire area of the Republic. This necessitated forced marches for days over mountain ranges, long periods of garrisoning isolated hotbeds of brigandage or revolution, and in general subjected them to the hardships of a guerilla warfare conducted in a tropical country. The last actual fighting occurred in 1921. Since then Marines have been garrisoned in more or less permanent posts. . . . On the establishment of these more or less permanent posts the naval medical officers on duty with the troops busied themselves with general sanitary measures such as drainage, cutting down underbrush near camp, filling in or oiling pools of water, etc. Despite these ordinary means and the compulsory use of the mosquito bar at night, malaria was rampant, reaching its high point in August and November of 1920 and in February and June of 1921. In some detachments the admission rate was over 4,000 per 1,000."

Dr. Storch[3] states:

"Every native upon questioning has admitted at least one attack a year: the average number of attacks, however, is three or four, while one man stated that he had twelve attacks during the year. In Port-au-Prince an examination of 800 slides shows an average of 42 per cent infection. Pont Beudet, 12 miles northeast of Port-au-Prince, showed 60 per cent infected."

In 1925, outlying posts were abandoned and all Marines garrisoned in Port-au-Prince and Cape Haitian. Reports of the Brigade Surgeon of the incidence of malaria since then show for the fiscal year 1926 (July 1, 1925, to June 30, 1926) an annual admission rate per 1000 of 124.3; for the same period of 1927, 53.4; for 1928, 137.9, and for 1929, 90.9.

Statistics furnished by the Medical Director Garde d'Haiti are of interest. The organization, in effect a national army, has a personnel of about 2,000 composed of native troops and officers with 120 Marine officers. The Garde personnel is distributed throughout the island in every city, town and country village. Except that they have better food, clothing and medical attention, these men may be considered to represent a fair sample of the population. They do not live in screened barracks, use no mosquito nets, and by the nature of their duties are exposed to malaria to as great a degree as the civilian population. In Table I the annual admission rate per 1,000 is shown.

The largest number of laborers and school children to be examined by a single group of laboratory specialists was that done at the emigration bureau of the United Fruit Company, Port-de-Paix, November 30, 1927, to January 30, 1928.

TABLE I

Malaria Admissions, Garde d'Haiti, 1924 to 1929
Annual Rate per 1000

	1924	1925	1926	1927	1928	1929
January	242.2	165.6	120.0	163.0	140.4	121.2
February	166.8	171.6	134.4	150.0	109.2	84.0
March	122.4	80.4	120.0	74.4	128.4	93.6
April	114.0	78.0	107.6	55.2	109.2	60.0
May	100.8	90.0	55.2	92.4	56.4	92.4
June	204.0	170.8	135.6	68.4	94.8	106.8
July	363.6	138.0	117.6	108.0	188.4	82.8
August	273.6	268.8	94.8	94.8	207.6	141.6
September	235.2	224.4	178.8	195.6	122.4	106.8
October	268.8	277.2	247.2	134.4	218.4	
November	279.6	229.2	235.2	217.2	85.2	
December	229.2	181.2	272.4	129.6	122.4	

A total of 11,000 laborers were examined by thick-film and 23.5 per cent found positive. Of the 2,007 children examined 50.52 per cent were positive.[4]

Other workers have reported a high proportion of malignant tertian infections in Haiti and this survey confirms this observation, 86.3 per cent of the laborers and 86.19 per cent of the children presenting this type of infection.

Within the past year 3,176 school children were examined in Port-au-Prince with a finding of 8.2 per cent positive.

In November, 1928, an epidemic was reported at St. Louis du Sud, a town of 700 people on the South coast. Investigation revealed 65 people of all ages ill in their homes. Blood smears were positive for malignant tertian malaria in 63 of them. In the same month smears made on 25 children in the market place of this town were 100 per cent positive.

In March, 1929, some of the inhabitants of Vieux Bourg, a town of about 200 people, also on the South coast, reported much fever in the town. Forty-three persons with fever were seen and blood smears made on these were 39 per cent positive for malaria.

Anopheles albimanus, the malaria vector in Haiti, breeds anywhere and everywhere in almost any kind of water. This statement, originally made by Peterson and Hoffman, has been confirmed by other workers. While there may be a preference for certain types of water and a particular kind of food, from a control point of view no collection of water can be disregarded. Clean open water with algae or other vegetation, such as is found in rice fields, appears to be very favorable breeding sites. Running water, such as irrigation ditches, is less

desirable, although breeding does occur in such locations.

Household and yard containers that are preferred by *Aedes aegypti* do not particularly attract *albimanus*. They have, however, been found in such places. In towns where shallow wells are used, many of them become overgrown with algae and furnish many anophelines.

In a swamp near Petit-Goave *albimanus* larvae were found in the grass along a drainage canal near the sea. The salinity of this water was 0.3 per cent sodium chlorid.

Breeding in a river near Jeremie is of interest, as it nearly parallels conditions at Quantico, Virginia, Broad River, South Carolina, and a few other places in the United States. This river, which is about 150 yards wide, has a heavy growth of chara and potomogeton along the west bank and extending about 60 feet towards the center of the stream. In this dense mat of vegetation in water from two to six feet in depth *albimanus* was found in tremendous numbers. The water is clear and fresh and has a perceptible current.

Quadrimaculatus bred heavily in a strikingly similar situation in Quantico, Virginia.

A. grabhamii is the only other anopheline thus far discovered in Haiti.

With conditions as described in the preceding sections, the problem of malaria control has been and still is an exceedingly grave one.

The policy of first attacking the centers of population was adopted early in the history of the Public Health Service and has been steadfastly adhered to.

As a result we can point with pardonable pride to the satisfactory degree of control in Port-au-Prince, Cape Haitian, St. Marc, Gonaives and Jeremie.

Efforts at control have been along three main lines:

(1) Drainage and filling.

(2) Use of larvicides.

(3) Quininization.

Port-au-Prince being the largest city in the island and also the capital, the earliest efforts were directed towards ridding this city of malaria. The water front for a distance of almost two miles, originally a swamp, with many rice fields and prolific anopheline breeding, has been filled in and drained. Other low-lying sections in the city have also been drained. Although it can not be said that there is no malaria in Port-au-Prince, it has ceased to be a problem and most residents no longer find it necessary to screen their homes nor use mosquito nets.

In Cape Haitian extensive drainage and filling since 1915 has materially decreased the malaria incidence.

In St. Marc, a town of about 12,000, several sluggish streams that formerly ran in crooked, winding channels through the city have been straightened, filled along the sides, and in places cemented. All the principal streets in the town have been graded and curbs and gutters installed. As a result St. Marc is practically free from malaria.

Gonaives, a town of about 15,000, is located 110 miles northwest of Port-au-Prince on the edge of a desert. North and east of the town there are a number of springs and swamps that formerly furnished vectors for the town. These have been drained and connected through staked canals to a large canal that drains them into the bay south of the town. Undrainable places have been filled with street sweepings. This system of drainage canals has solved the situation there and requires only maintenance to keep the town practically free from malaria.

Jeremie and Jacmel, one on the southern and the other on the northern side of the southern peninsula, present common problems. They are both built on hillsides overlooking the sea with adequate slope for drainage. Emptying into the sea near each is a river that affords abundant breeding grounds for anophelines. In the city limits of each the construction of rock or cement lined curbs and gutters has practically obliterated favorable anopheline breeding sites. Breeding in the rivers is being controlled by Paris green dusting.

Petit-Goave, a town of perhaps 8,000, located 40 miles southwest of Port-au-Prince, is built on low land with mountains several miles south of it. From these ranges many streams flow down into the flat country, becoming sluggish as level country is reached and finally ending in large swamps. With such conditions in the city the problem may be easily visualized. At present all of them have been partially or completely ditched, low places filled and staked canals installed connecting them with the sea.

Cayes, a city of about 20,000 on the southern side of the southern peninsula, is located on a coastal plain that extends twelve or more miles back to the mountains. Ravine du Sud, west

of the city, is ordinarily a small, swiftly moving stream fed by springs in the mountains. Periodically heavy rains cause the stream to overflow its banks and inundate the town. At such times all the streets of the town are covered with water to a depth of two or more feet. Several large drainage canals help to carry off flood waters, and there are many low-lying areas that will be handled as additional funds become available. Within the past year over 25 miles of ditches have been dug in swamp areas within anopheline flight range of the city. In one section known locally as Habitation O'Shiell a drainage system primarily installed for mosquito control has reclaimed more than 1,000 acres of valuable farm land at a cost of $2.00 per acre. Work is about to commence on a dike road north of the city which will divert the flood waters and prevent inundation of the city. Filling of undrainable areas has been accomplished by use of street sweepings and sand.

Many property owners are averse to making improvements to their places, but will allow the Public Health Service to do the work for them at the owner's expense. This system has permitted obliteration of many breeding places within the city. It might be mentioned that this characteristic has been observed throughout Haiti.

In addition to major drainage projects such as those described a great deal has been accomplished in the smaller towns.

In some instances drainage in small communities has produced strikingly beneficial results. Unfortunately lack of local interest has permitted a lapse in some places. The policy at present is to install drainage systems only in places where there is reasonable expectation of permanent maintenance.

There is no single plan of drainage applicable to the whole island.

In Port-au-Prince, for example 1/3 section, 32-inch concrete tile has been used for open drains and for subsurface drainage 4-inch and 6-inch round tile.

In Petit-Goave, "V"-shaped earth ditches are used in certain sections and staked canals in others. These stakes are 3 to 4 feet long and about 2 inches in diameter. Placed close together along the banks, they support the bank and last several years.

They are used in many places and while not so satisfactory as cement, are much less expensive and serve the purpose very well. Permanent concrete canals are installed whenever money is available. All districts have their own tile-making machines for the 4-inch and 6-inch sizes. The low cost of labor makes the use of dynamite and machine ditching out of the question.

Laborers receive 20 to 30 cents per day for a nine-hour day and a plentiful supply is always available.

For filling near the sea beach sand is often transported in grass baskets on bourriques. These diminutive jackasses driven by a woman with a big stick are aptly said to carry the burden of Haiti on their backs. They are reputed to be able to carry a load equal to their weight.

Laden with sand, lime, rocks, dyewood, 6 squealing pigs, or 10 bleating goats, they steer a straight course in the center of the road from which no amount of honking, yelling or cursing will swerve them.

Until recently oil was the principal larvicide used. Crude oil purchased in the United States in 50-gallon drums costs about 20 cents per gallon delivered in Port-au-Prince. In other words, a gallon of oil and a day's labor cost about the same.

Waste oil in limited quantities is obtained in the larger cities at very small cost. This, diluted with kerosene, has been used with good results. Oil is applied by means of knapsack sprayers. The occurrence of daily rains during a portion of the year greatly increases the cost of oiling and also demands the use of a highly toxic oil. As new breeding areas are brought under control, the cost of oil naturally increases and the cost of this single item makes serious inroads on our budget.

Sporadic attempts have been made to substitute Paris green, but lack of familiarity with its use and limitations has prevented its general adoption. Experience with it during the past year has been very satisfactory and its use is being gradually extended over the island. Airplane dusting has been done in two areas with splendid results in each instance. One pound of Paris green per acre in a 33 per cent mixture with slaked lime was used.

Recent experiments with a mixture of Paris green and moist sand indicate its practicability as a general larvicide. Following the technic of Griffitts,[5] one teaspoonful of Paris green was mixed with 99 teaspoonfuls of moist sand. After thorough mixing it is applied by hand. This amount, when applied to 340 square feet of breeding surface, gave uniformly satisfactory killing of all larvae within three hours or less. After convincing ourselves of its efficacy against anophelines and non-anophelines in several different types of breeding area we made a number of attempts to reduce the dosage. In this effort we not only reduced the amount per acre by wider distribution, but also tried higher dilutions, namely, 1 to 150 and 1 to 200. In a few instances ½ pound and even 1/3 pound gave 80 to 90 per cent mortality. A higher dilution than 1 to 100 did not prove satisfactory.

As a temporary control measure quinine can and does accomplish much. In many rural communities it or some other drug will likely remain for many years the only agent at our disposal.

If all the natives who harbored malaria parasites could be induced to take adequate doses of the drug over long periods of time, there is little doubt as to the end result. This, however, is something for the educational work of the future. The longest period of treatment that can be expected at present is for the duration of fever. So long as the Haitian feels that he has fever he will probably continue treatment. There is no way, of course, to measure the benefit to a given community of such a varied procedure.

In each of the ten hospitals of the Public Health Service a thick smear is taken on each patient admitted. Those found positive are given quinine throughout their stay in the hospital.

In the 147 rural clinics thousands of treatments are given annually. It is not possible to do any laboratory work on these cases, as one physician may treat 500 to 1,000 people in a single day. Reliance for a diagnosis must, therefore, be placed on symptoms and a very brief history. All patients complaining of fever are given quinine unless there is some other obvious reason for the fever. The dosage depends on the individual prescribing treatment, although it may be said to average as much as 10 grains three times daily for a week. While such amounts surely do not render the man parasite free, he is given sufficient symptomatic relief to permit him to work and thus obtain food for himself and family. The free distribution of quinine through the rural clinics and hospitals is supplemented by its sale at cost to all who apply.

The percentage of illiteracy throughout the island is so high that publicity in the form of pamphlets or other printed matter is well-nigh impossible. News spreads through the rural sections almost entirely by word of mouth and attempts to disseminate information through the leading men in the community has proven to be of little value. In recent years all the larger towns have been equipped with radio, over which musical programs and news of the Governmental departments are broadcasted. Through this medium public health information is disseminated. In the cities information is published in the newspapers.

The Agricultural Department has farm schools in many of the rural communities and the teachers from them are brought to Port-au-Prince every summer for a six weeks' course at the Central Agricultural School. Included in this course are lectures by the Public Health Service on a number of subjects, including malaria. They will no doubt carry some knowledge of malaria back to their school children.

Children in the public and private schools of Port-au-Prince are given weekly talks on hygiene and other subjects, particularly including malaria. As funds and properly trained personnel become available this work will be extended to cover all of Haiti.

In examining school children blood smears are taken and those found positive are advised to go to the Health Center for treatment.

SUMMARY AND CONCLUSIONS

(1) Malaria, yaws and intestinal parasites are principal causes of morbidity in Haiti.

(2) Improved sanitary conditions since 1916 are responsible for a marked diminution in ma-

laria incidence in the larger centers of population.

(3) *Anopheles albimanus*, the malaria vector for Haiti, is found throughout the island at elevations below 3,000 feet.

REFERENCES

1. Allen, A. H.: The Problem of Malaria in Marines in Haiti. Naval Med. Bull., 18: No. 1, Jan., 1923.

2. Allen, A. H.: Report of an Anti-Malarial Campaign Conducted by the Medical Officers of the First Brigade, U. S. Marines in Haiti. Naval Med. Bull., 19: No. 4, Oct., 1923.

3. Storch, R. B.: Personal Experience with Malaria Among Natives of the Republic of Haiti. Naval Med. Bull., 19: No. 4, October, 1923.

4. Wilson, P. W.: Report of Malaria and Micro Filaria Survey of 11,000 Laborers and 2,007 Children in Haiti. Naval Med. Bull., 27: No. 1, Jan., 1929.

5. Griffitts, T. H. D.: Moist Sand Method of Applying Paris Green for Destruction of Subsurface Feeding Mosquito Larvae. U. S. Public Health Reports, 42: No. 44, Nov. 4, 1927.

DISCUSSION (*Abstract*)

Dr. Mark F. Boyd, Jackson, Miss.—I should judge that from an epidemiological standpoint the picture that Dr. Cook has sketched does not differ radically from that which might be presented by any of the West Indies. Any difference that one might note is due to the peculiar political and social conditions that prevail in Haiti.

The problem that faces Dr. Cook and the American administration is undoubtedly complicated by the absence of medical practitioners over a great bulk of the country, so, in considering the malaria problem they have not only to consider curative, but preventive, medicine as well.

I anticipate that the species mentioned as occurring in Haiti will later be increased by one or two species. *Vestitipennis* has been found in Porto Rico and Jamaica, and will probably be found in this island as well. *Anopheles crucians* may later be found.

Dr. Henry E. Meleney, Nashville, Tenn.—One of the most interesting things which Dr. Cook has reported is the use of Paris green as a general larvicide. If his observations are confirmed in this Country, the use of Paris green may prove to be a very important method of general mosquito control.

Dr. Cook (closing).—I have not reported the experiments with Paris green, because we are still running some and planning to test its toxicity for animals.

The native of Haiti will drink any kind of water, no matter how hot or how foul. Of course, we have said that Paris green does not make drinking water poisonous. But, in our Country we have not the trouble we have in Haiti: Americans do not drink just any kind of water.

We have observed that in a number of places where the cattle and horses drink the water they are not affected.

MALARIA IN HAITI*

By FREDERICK L. HOFFMAN, LL.D.,†
Wellesley Hill, Mass.

The malaria problem in Haiti, after a number of years of American administration, is in a fair way of being solved, if we define the word solution as a reasonable compromise between the ideally desirable and the practically possible. Dealing with a vast and primitive population, there are insuperable difficulties which can be solved only after many years. The problem is visualized in the statement that in the calendar year 1927 rural clinics in Haiti under the direction of the American Government dealt with 31,483 cases of malaria, from the most mild to the most malignant types of the disease. In the public health hospitals under the American administration the number of out-patients treated for malaria was 3,613 and the number of in-patients 331. The in-patients had 3,944 days of treatment, while the out-patients had 5,370 days of consultations and treatment. Obviously the latter received practically but superficial attention or represented comparatively mild types of the infection.

It has been my privilege to visit some of the rural clinics in the vicinity of Port-au-Prince, and I can only express myself as being most favorably impressed with the attention which is being given to individual patients on the part of an inadequate medical staff. But to me nothing is more encouraging than to observe the large number of patients who throng the clinics with perfect faith in the skill of the attending American and native physicians. The American Government in Haiti is utilizing native personnel to the fullest extent and the Haitian native medical profession is second to none in its adaptability to the needs of local requirements. The same applies to native nurses, whom I found admirably adapted to native needs.

The number of deaths from malaria in Public Health hospitals in Haiti for the year 1927 was surprisingly low. There were 25 deaths from malaria and 14 from malariae cachexia. Most of these deaths occurred above the age of twenty. In the whole Republic during 1927, the num-

---

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†Consulting Statistician Prudential Insurance Company of America.

ber of deaths from malaria was 1,096. Of this number, 557 were deaths of males and 539 deaths of females. There was also one death from hemoglobinuric fever and one death from malaria cachexia. Unfortunately as yet the registration of deaths for the entire Republic is incomplete, so it would not be advisable to calculate death rates in proportion to the estimated population. As observed in the annual report of Commander K. C. Melhorn, Director General of the Public Health Service of Haiti,

"The vital statistics in Haiti continue to show many discrepancies and will continue so until the present archaic laws governing registration of births, deaths and marriages are annulled and replaced by legislation whereby such registrations can be made free of any and all tax to the entire population. Now only indigent persons register free of tax."

As long as these conditions prevail, complete registration of deaths is, of course, practically hopeless. The problem is to appeal to an estimated population of about 2,000,000 scattered over an immense territory, much of which as yet is difficult of access, presenting possibly one of the most perplexing problems in registration anywhere in the Western world. But progress is being made, thanks to the progressive and always energetic health administration of the American Government, which is a credit alike to the United States and to the heartily cooperating native population.

The Division of Laboratories of the Public Health Service is divided into three units under the supervision of a director, a medical officer of the United States Navy, with central offices at Port-au-Prince. With reference to malaria, it is said:

"In the department of malaria the thick-film method is used exclusively with most gratifying results. We find this technic not only to be less laborious, but the results are far more accurate than those obtained from thin smears. Our routine is to examine every patient for malaria who is admitted to the hospital and to re-examine the following day all those who are negative on the first test. The technic employed is to take a large drop of blood from the ear on one end of a clean slide. With the corner of another slide, spread this out over an area the size of a dime and allow to dry thoroughly, about thirty minutes in the air. Twenty-five slides are now numbered and bound together with elastic, interposing a piece of card board between each. The ends of the slides having the blood are immersed in a rectangular staining dish containing dilute 1-15 Azur 11 Eosin, Grubler, for 30 minutes. At the end of this time they are removed from the stain, immersed in distilled water to remove the excess stain and allowed to dry in the air without blotting."

The foregoing is sufficient evidence that the scientific work in connection with malaria cases is fully equivalent to what is being done on the mainland of the United States. I may add that a number of Haitian technicians are employed in connection with this work and are rendering excellent service. The number of blood smears examined for malaria in 1927 was 5,733.

On the subject of mosquito control the report for 1927-28 contains in part the following interesting observation:

"Much has been accomplished during the past year in filling and draining the swampy areas in the southwest portion of the city along the shore line. Work in this section has been continuous for several years in an attempt to drain and fill swamps within the anopheline flight distance of the city.

"The swampy area back of the electric light plant, formerly a network of poorly graded open ditches, has been drained with subsurface tile and filled with refuse. A deep ditch was dug from the upper part of the property to the sea, graded with rocks on which two rows of six-inch tile were laid and covered with gravel and refuse. Many laterals of four-inch tile laid in the same manner and covered with gravel and refuse has rendered the swamp entirely dry. This property has an area of about two acres and is adjacent to the boys' reform school, which has an average of 300 inmates. Malaria rate amongst these boys has always been very high, 135.7 per thousand for last year probably being comparatively low.

"Fourteen thousand six hundred sixty-four gallons of crude oil and one thousand nine hundred seventy-six gallons of kerosene were used during the year in this district in mosquito control work. The kerosene is used to dilute to spray consistency the old crank case oil obtained from various garages without cost. Some experimental work in use of Paris green as a larvicide was done. It was determined that for our work in and near the city the use of oil has the advantage. When mosquito control can be extended to the swamps and rice paddies in the rural sections Paris green will undoubtedly be the accepted larvicide. Control of the breeding of domestic mosquitoes is a very discouraging problem. Water is stored in some form of container on practically every property. Of the notices sent out last year in Port-au-Prince 7,595, or 31.8 per cent, were offenders against the mosquito breeding regulation."

During the year under review the percentage of property inspected showing larvae ranged from 1.1 per cent in July to 2.7 per cent in October. To the foregoing, I add a few observations for particular districts as illustrating the local work that is being done:

"There was no recurrence of the mosquito breeding in the salt marshes south of Cape Haitian such as occurred last summer. The tide gates put in during

the winter and the drainage canals dug there proved effective in preventing this annoying occurrence. Malaria is rarely seen in Cape Haitian now and the few patients treated at the Justinien Hospital contract the disease outside the town. The filling in of low marshy ground about Cape Haitian was continued during the year. Twelve thousand seven hundred and forty-two (12,742) cart and truck loads of rubbish from street boxes were dumped here. The oiling and closing of abandoned wells was continued. The system of house-to-house inspection was continued."

For the sanitary district of Aux Cayes it is said:

"The filling of the Renaud River, draining of swamps and oiling have been continued throughout the year. Most of the water holes produced by the construction of curbs and gutters and the concrete drain were filled up. Eleven private properties in the low sections of the town were filled with fatra, sea sand and gravel and part or total expenses were reimbursed to the Service for work done."

A brief account of the district of Jeremie states:

"In the town of Jeremie no larvae of the anopheles mosquito were found. The larvae of others were found in 536 places. Oil sprays are used to destroy these breeding places.

"The town of Dame Marie is heavily infested with malaria, but it is hoped that this condition will be ameliorated soon, as the Public Health Service has turned over to the public works sufficient money to drain a number of swampy areas."

The problem is rather serious in the sanitary district of Petit-Goave, as illustrated by the following statement:

"On account of the topography of much of the land near Petit-Goave, the control of the mosquito breeding continues to be a major problem, and for complete eradication of this pest, the expenditure of much money will be necessary. It would seem that if some of the high mountains could be torn down and dumped into the swamps that the leveling up would help in more than one way. Unfortunately the level of the swamps does not permit of good drainage into the sea. In fact, in some places, the marshes appear to be below the sea level."

An extended account is rendered for the district of Saint-Marc, from which I quote in part as follows:

"This will continue to be one of the most important problems in sanitation. The numerous cane fields, rice fields and banana gardens within the city limits offer obstacles which are difficult to overcome. In order to eradicate Anopheles breeding, it is necessary to keep constant supervision over the numerous irrigation canals to keep them open, repaired and free from vegetation. The only solution to the problems would be, if possible, to discontinue all farming within the city limits and cement all irrigation canals. Various dirt canals have been opened during the year and this has made a big improvement in certain parts of the town. The three inspectors are constantly going over the town looking for mosquito breeding places and eliminating them, also spraying oil on all stagnant water found, instructing the owners of properties as to the proper methods to be taken to eliminate the mosquito breeding places that are found. We have been successful in convincing some of the property owners that not only is the sanitary condition of the town improved, but that over a period of years it is more economical to have cement canals than dirt canals for irrigation purposes. They have co-operated with the Service d'Hygiene and have built the cement canals, thereby eliminating several bad mosquito breeding places."

It has occurred to me that the foregoing extracts from the last annual report of Commander Melhorn would serve a better purpose than observations of my own based on a rather hurried inspection during the early part of the present year. The American Public Health Service of Haiti is leaving nothing undone to bring the malaria problem to at least as high a degree of control as in the malaria sections of this Country. Americans have reason to be proud of what the American Government has done in the Haitian Republic in every possible direction ministering to the higher needs of a primitive population, but in no direction has more effective service been rendered than in the promotion and development of the native medical organization, which is rapidly filling most of the important posts connected with the sanitary administration of the Island. The native Haitian has shown a remarkable degree of adaptability, is eager to learn, and anxious to apply whatever may be learned from the experiences of the greater Republic which for the time being administers all the essential governmental functions in the Haitian Republic. To the student of the malaria problem, Haiti at the present time is a great laboratory and many questions are being dealt with in the light of the most advanced scientific research with the hope that in a few years the malaria problem in Haiti will be under effective control and that the menacing condition found to exist at the time of our occupancy will be a thing of the past.

MALARIA CONTROL IN ALABAMA, 1928*

By STUART GRAVES, M.D.,†
Montgomery, Ala.

At this season of the year it is difficult to summarize activities for the current year, so this present report covers activities for 1928.

Except in impounded water areas malaria control is included as one of the functions of county health departments and the State acts in an advisory capacity only. Engineers are available to make preliminary surveys and advise as to the best means of control, but the details of supervising control measures rest with the county health departments.

During the year 1928, surveys and estimates of the cost of control were made in twelve municipalities. In addition seven rural areas were surveyed to determine the extent of the problem and the most feasible means of control. It was realized that the personnel of many of the units was in need of detailed training and steps were taken to provide this.

The control of the impounded water areas remained with the central organization. Seventy inspections were made of the 82 projects in the State. Some of the small ponds were not visited, but all the important projects were kept under supervision. Nine of the larger areas made weekly reports as to control work done and the status of breeding throughout the season.

Due to excessive rainfall early in the season, conditions were particularly suitable for the breeding of *A. quadrimaculatus* and there was a considerable increase in the malaria incidence. This was particularly true of some of the densely populated rural sections around natural bodies of water. There was no increase from the impounded water areas.

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†Temporary Acting State Health Officer.

MALARIA CONTROL IN GEORGIA*

By L. M. CLARKSON,
Atlanta, Ga.

Due to an exceptionally heavy rainfall in 1928, over 10 inches excess above normal, malaria showed a decided increase over previous years, maintaining this high increase in 1929. To date there has been an excess for 1929. Although this condition was somewhat discouraging to those connected with malaria control, it brought great benefit by arousing public sentiment to the seriousness of the problem and to the necessity for greater efforts for control. An interesting fact has been the shifting of malaria foci to sections normally only slightly affected. This condition has caused considerable alarm and has consequently stimulated prompt action toward eliminating the problem in order to avoid annual repetition. One outstanding result has been the initiation of organized county health work specifically for malaria control. During 1929, at least six counties adopted specific campaigns for malaria control, augmented by the State Board of Health with special sanitary engineering assistance. Practically all of these counties have accepted engineering service from the State Board of Health in drainage surveys, mapping, planning and estimating costs. Municipalities have also expanded their drainage and larvicidal control methods to an extent heretofore unequaled.

Control of impounded waters by the State Board of Health has expanded. To date, there are approximately forty impounded areas for hydro-electric development purposes, comprising over 100,000 acres involving over 50 counties, all of which are under careful observation or under intensive malaria control. This feature of the work is operated under permits issued by the State Board of Health. It is followed by clearing of all vegetation and subsequent mechanical larvicidal control measures during Anopheles production season. The two prime methods of malaria control in Georgia are through drainage and impounded water regulations, drainage to eliminate natural and useless waters on the one hand, and regulations to control artificial and necessary waters on the other.

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

We have passed through a dark period of impounded water control and at times our problems seemed almost hopeless. We are now emerging from this period and feel very optimistic. Although rural drainage is progressing in several counties on a large scale, we shall welcome the day when drainage by county officials will keep step with control of impounded waters by corporations.

MALARIA CONTROL IN MISSISSIPPI DURING 1929*

By MARK F. BOYD, M.D.,†
Jackson, Miss.

The activities of the State Board of Health during the current year have been promoted along the following lines:

(A) *Relation of Program to County Health Department.*—The whole-time county health departments, created through the initiative of, and furthered by, the State Board of Health, are devised to achieve the intimate contact with the citizenship of the State, which is essential to the promotion of public health. Any malaria control activities whatsoever, promoted by the central state organization, should be done by, through and with the whole-time health department. Consequently, in order to be practical, any program of malaria control must be one the execution of which can be effected with the personnel and resources ordinarily available to these organizations. But rarely will it be possible to secure extraordinary assistance to these departments for the furtherance of a malaria program. Consequently, the program must be of the utmost simplicity, taking full cognizance of the fact that the work of a county health department is necessarily varied, and placing a judicious restraint upon an enthusiastic optimism that would expect to effect the execution of the plans in a year and a day.

(B) *Malaria Morbidity Reporting.*—Improvements in the reporting of malaria cases is felt to be necessary for control work. The present reporting system does not individualize the cases reported, consequently the present reports cannot serve as the foundation upon which to formulate and execute plans for control. In order to achieve this purpose, cases must be reported individually with full particulars given concerning the place of residence. Because of the number of reports that physicians will be required to make, efforts should be made to simplify the reporting.

As a corollary to the efforts to improve morbidity reporting should come the effort to improve the standards of malaria diagnosis. The employment of this term as a catch-all diagnosis for obscure conditions should be discouraged, and, on the other hand, every effort should be made to increase the proportion of diagnoses which are based on blood examinations. To further this aim, physicians are gratuitously furnished, through whole-time county health departments, with simple outfits for the collection and transmission of diagnostic specimens.

County health departments are expected to maintain and currently post with the latest data, malaria maps of the county, on which are located, according to place of residence, every blood verified case of malaria whose existence is ascertained, either from monthly summary returns received from the state laboratory or from the county health department laboratory, or through cooperation with private clinical laboratories.

Such maps will go far to reveal the principal local endemic centers within a county.

(C) *Screening of Rural Tenant Houses.*—The perfection of the technic of screening rural tenant houses through the studies of the United States Public Health Service is, in our opinion, an outstanding contribution to the solution of the problem of rural malaria control. The possibilities for the extension of this practice through the whole-time county health departments are great.

Through the cooperation of the Bureau of County Health Work of our Board, health departments situated in the Yazoo Delta are commencing an energetic campaign during the present winter, in preparation for the season of 1930,

---

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†Director, Bureau of Malaria Control, Mississippi State Board of Health.

though at no time will the matter be dropped until screens are as well recognized a part of house equipment as the roof.

It is our conviction that the establishment of one, or at most a few, centrally located screen door factories operated by private capital is a more effective arrangement, since it reduces the load of administration the health officer carries, as well as freeing him from vexatious questions of credit and collection.

(D) *Promotion of Minor Drainage.*—In our Delta section the malaria-carrying *quadrimaculatus* breeds practically everywhere that water is found. Any extension of drainage will therefore reduce breeding opportunities. In order to promote drainage and assist in making people drainage-conscious, an engineer has been assigned to the health departments of three counties, whose services are free to any municipality or private land owner for the solution of drainage problems. He will make surveys giving the property owner lines and levels necessary to enable him to execute his work. The service is proving popular and a waiting list of applications now exists.

(E) *Educational Work.*—The persistence of endemic malaria in the United States is probably in the greatest degree attributable to ignorance. The education of the people who suffer from this scourge is probably the most effective work that we accomplish.

The screen wire cloth manufacturers have agreed to cooperate with our own and adjoining states during the coming year in a campaign to promote knowledge of the benefits of screening. Further information will be available from their representatives.

We intend to make a special effort to inform negroes of the malaria situation as it affects their race, and are making plans with this end in view.

(F) *Current Malaria Incidence.*—From available information, the malaria incidence of the current year in the Yazoo Delta was less than during 1928. Elsewhere in the State the disease appeared stationary or slightly more intense, particularly along the Gulf Coast.

MALARIA CONTROL WORK IN MISSOURI, 1929*

By W. S. PETTY, M.D.,
Jefferson City, Mo.

Malaria is a minor problem in the State as a whole, but it is a major problem in the Southeastern sections of Missouri, comprising an area of seven counties.

Dr. James Stewart, State Health Commissioner, and W. Scott Johnson, Public Health Engineer, have started direct control measures in these counties along the following lines: education, screening, individual farm ditching and ditch maintenance. This work is being carried out by the county health departments, of which there are five, two counties of the area not having full-time public health work.

Several different school districts have inaugurated a campaign for screening. One complete school district was screened, and after screening showed a 42 per cent reduction in the number of malaria cases.

Some studies were made at the suggestion and with the help of Mr. LePrince regarding the feasibility of Paris green dusting of drainage ditches. This project will be continued next season more extensively.

There has been practically no interest displayed by the communities in our malaria section. Interest in this work will have to be stimulated and it will be our aim to keep working in this area. It is hoped that more interest can be stimulated and every effort will be made by the full-time units in the malaria section to increase control measures.

At the present time a large impounded project is under way on the Osage River, a short distance from Jefferson City. In recent years very little malaria has existed in the basin of this water power project. During a recent mosquito survey a fairly high proportion of *quadrimaculatus* mosquitoes were found. This area is close to the Missouri River bottoms, where localized outbreaks of malaria occur.

With the large influx of laborers, with some from malaria sections who might be carriers, the State Board of Health, working in cooperation with the United States Public Health Service and

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

the local county, has organized a full-time health unit in Miller County, where the project is located, and has made recommendations to the Power Company, which its officials are now taking steps to carry out.

MALARIA CONTROL ACTIVITIES IN NORTH CAROLINA*

By CHAS. O'H. LAUGHINGHOUSE, M.D.,†
Raleigh, N. C.

The malaria control problems in North Carolina lie principally in the eastern part of the State, that is, in a tier of counties, about two in width, extending along the Atlantic Coast.

There are at present 43 full-time cooperative county health organizations within the State and twelve of these are situated in the eastern section of what is known as the "Malaria Belt." Each county has a malaria rate sufficiently high to make the disease of public health importance.

The "Malaria Belt" of the State comprises a total of 33 counties. It is within these counties that the harmful effects of the disease are felt and where the Board of Health has concentrated its efforts toward control through the organization of full-time county health units with adequate personnel to handle the situation of the prevalence of the disease as its economic importance in each county may demand.

The Board of Health believes that malaria control, or at least malaria reduction on a county-wide basis, is well within the realm of possibility for the average county health department. This fact has been strikingly demonstrated in certain counties in the eastern section of the State.

It is the purpose of the Board to continue to extend measures for the control of malaria as rapidly as the organization and funds will permit. The problem which confronts us for 1930 is the impounding of water for hydro-electric purposes. The plan now in effect for handling such problems is to extend malaria and mosquito surveys over the areas of any proposed project for at least twelve months prior to the impounding of water for the purpose of determining what, if any, influence the impounding of water may have upon the mosquito rate or malaria incidence. The same measures employed prior to the impounding of water may be extended over a period of at least twelve months after water has been impounded. By such methods it is hoped to obtain comparative data which may be used as a basis in formulating rules and regulations for the control of similar projects.

The department assuming the administrative duties for the investigation and control of malaria fevers is the Bureau of Epidemiology. This Bureau has assigned to it a full-time malariologist, who devotes his time to the promotion of control measures. The primary object is the mapping out of the malaria problem in all the counties within the malaria zone and instructing employees of local county health units in measures for the control of the disease. There is a secondary object of even greater importance; that is, the stimulation of permanent interest and activity in public health work in general and the local demonstration of methods whereby disease prevention can be carried on economically and on a large scale by free and generous support of full-time local health departments.

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†State Health Officer.

MALARIA ACTIVITIES IN SOUTH CAROLINA*

By A. E. LEGARE,†
Columbia, S. C.

We had an immense carry-over of malaria in 1928 and during the spring of this year, owing to floods, the case rate was greatly increased. However, there was, fortunately, no increase in the case rate over last year.

Unfortunately, in our State for the past four years our malarial section, which is an agricultural section, has been very hard hit, and no drainage propositions of any kind could be undertaken. Therefore, most of our work has been along educational lines. We have tried to induce the people to use proper control measures and we have advocated screening and quininization.

Our educational program was greatly helped by lectures at a meeting of four or five thousand farmers and their families at our Agricul-

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†Sanitary Engineer, State Board of Health.

tural College. Our impounded water regulations are strictly enforced with good results, and we have induced practising engineers to incorporate these regulations in their specifications for water systems having large storage basins.

Regarding the question of labor camps, we are now in the era of large road building construction. The State Highway Department has incorporated our camp regulations in its specifications, the main part of these regulations being that camp foremen are required to report to local health authorities any cases of sickness in the camps and upon their report these cases are promptly investigated. Of course, most of these cases are malarial.

The State Highway Department is also cooperating with us in requiring proper drainage of borrow pits on all new work, and in the case of old work our engineers go over different divisions and indicate control measures to be adopted in existing borrow pits and improperly placed culverts.

We are continuing our educational program among engineering students by lectures to such classes at our three universities. These lectures have been carried on for the past three years, and we now have engineers on our roads and other work who have been to a certain extent informed as to their responsibility for malaria prevalence.

This covers the special work done by us during the past year.

MALARIA CONTROL ACTIVITIES IN TENNESSEE, 1929*

By E. L. Bishop, M. D.,†
Nashville, Tenn.

Extensive and intensive studies of our malaria problem in the western section of Tennessee were carried out this year with Dyersburg as a field base. All of the counties bordering on the Mississippi River in this State now have full-time health departments, Tipton County starting on a full-time basis on October 1. These border counties average from twice to several times as much malaria as the neighboring counties not bordering on the River. Moreover, both mortality records and surveys indicate that malaria is on the increase in West and Middle Tennessee.

Owing to the importance of malaria in the counties bordering on the Mississippi River, a definite study and control program has been developed during the past two years. This program consists of:

(1) Screening and mosquito-proofing houses on a county-wide scale.

(2) Studying malaria by school and community surveys.

(3) Studying Anopheles breeding.

(4) Experimenting with Paris green as a larvicide in order to ascertain the most effective method of using it in the territory concerned.

The assistance of the United States Public Health Service and of the Department of Preventive Medicine of Vanderbilt University has been secured in carrying out this program.

Screening and Mosquito-Proofing of Houses.—Early in 1928, a county-wide screening program was inaugurated in Lake County. To date, 81 per cent of the rural homes in this County have been screened and the owners of an additional 8 per cent report that they will screen as soon as the present cotton crop is harvested. The local screening committee is aiding the local health department in persuading the remainder of the property owners to do screening, so that Lake County can be completely screened, if possible, by June 30, 1930.

Lauderdale County has mosquito-proofed all of the 58 houses on the Henning Farm as a demonstration preparatory to more extensive operations in 1930.

Shelby County has launched a county-wide house mosquito-proofing program and a rotating fund has already been secured for the work. The County's entire force of sanitary inspectors has been trained in measuring houses and estimating the cost of screening and other mosquito-proofing work, as well as in the making of the doors, hanging them, and actually doing mosquito-proofing work in the field. The County has built equipment for two screen door producing units.

School and Community Surveys.—Blood surveys of all the schools in Lake and Dyer Counties were made in the spring and again late in the summer. In August and September, surveys were also made of all the schools of Lauderdale County, all the schools of Shelby County outside

---

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†State Health Officer.

the metropolitan area, and selected schools in Tipton and Obion Counties. Community surveys for malaria and *quadrimaculatus* adults were made in Dyer County in connection with the experimental work with Paris green, and in Lake County as a follow-up of surveys made last year.

Anopheles Breeding.—In Dyer County weekly or semi-weekly visits were made to a large number of catching stations in order to follow the trend of breeding and the number of adult *quadrimaculatus* mosquitoes. The entire County was surveyed for the location of probable breeding places and observations were made on the rise and fall of the flood waters of the Mississippi and its tributaries in this County.

Malaria Laboratory.—A special malaria laboratory was established in Dyersburg for the purpose of facilitating the survey work and the studies of Anopheles breeding. This laboratory also examined several hundred blood specimens for malaria sent in by physicians in West Tennessee. Reports of the results of these studies and of the screening work are to be made separately.

Paris Green Studies.—Tennessee was again fortunate in having the cooperation of Mr. J. A. LePrince and Mr. H. A. Johnson, of the United States Public Health Service, for the study of methods for dealing with the extensive *quadrimaculatus* breeding places in the bottom lands. Dyer County was made the center of activity. Paris green was applied by various methods of dusting to an area of about 110 square miles, and estimates were made of the cost and effectiveness of the work. A separate report of this work is elsewhere presented.

Other Control Activities.—In addition to this intensive program in West Tennessee, the Department has assisted the following 22 cities in mosquito control: Memphis, Covington, Ripley, Halls, Dyersburg, Tiptonville, Ridgely, Union City, Martin, Dresden, Trenton, Humbolt, Milan, Jackson, Cowan, Brownsville, Nashville, Franklin, Murfreesboro, Cookeville, Chattanooga and Greenfield. The methods used in these cities have consisted of drainage, oiling and dusting with Paris green.

The Department has also supervised the control of Anopheles breeding on two impounded water projects, those of the Tennessee Electric Power Company at Rock Island and the City of Cookeville at the Falling Water River Reservoir.

MALARIA IN VIRGINIA*

By HARRY G. GRANT, M.D.,
Richmond, Va.

I have no written report on malaria control in Virginia, as the small amount of work done this year hardly justifies one.

Malaria in Virginia is chiefly in the Tidewater section of the State, in which section there are ten counties under control of medical health officers with a total population of 250,000 people. All of these counties have been surveyed, *quadrimaculatus* breeding determined and records have been kept. The amount of breeding and the amount of malaria has become so small that this year I have requested the health officers to limit their activities to the investigation of cases reported.

Our records show that in the State there were 3,861 cases of malaria reported in 1921, with 1,106 in 1928. The number of deaths reported in 1921 was 43 compared with 13 deaths reported in 1928. To check our reporting, particularly since malaria has increased in other Southern states, a survey was conducted in November, 1928. This survey was carried on with the cooperation of Dr. L. L. Williams, Jr., of the United States Public Health Service. The parts of the State surveyed were those in which we knew from experience that malaria had been prevalent in the past. A thick blood smear was used in this survey. So far, out of 6,211 thick bloods taken in Nansemond, James City County, Princess Anne, Cumberland, Greenville, Southampton and Isle of Wight, there have been 43 positives.

We still carry on our educational work throughout the State. This year circulars were distributed in 21 counties dealing with malaria control and the value of screening.

---

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

MALARIA WORK*

By JOHN A. FERRELL, M.D.,
New York, N. Y.

The International Health Division of the Rockefeller Foundation has only one member of its staff engaged in malaria work in this Country at present. This is Dr. Boyd, who is serving as Malariologist with the Mississippi State Health Department. No independent studies are being undertaken in the United States.

We are giving financial aid to and through five state health departments, mainly toward the compensation of directive personnel that devotes itself to malaria survey and control measures, in cooperating with the local authorities. Dr. Earle has reported his activities in Porto Rico, which our organization is supporting.

FIELD INVESTIGATIONS OF MALARIA*

By E. R. COFFEY, M.D.,†
Richmond, Va.

The office of Field Investigations of Malaria has been primarily interested, during the past year, in determining the efficacy and relative cost of county-wide malaria control with Paris green dusting. In one county, dustings were made at ten-day intervals, and in another county at thirty-day intervals. Data on these two projects are now being compiled and soon will be ready for publication in the Public Health Reports.

Some experimental work has also been done with calcium and aluminum stearates as diluents for Paris green. The stearates being much lighter than the hydrated lime ordinarily used, it was hoped that Paris green would be held on the surface of the water a longer period of time, thereby extending the period of toxicity of Paris green to Anopheles larvae. Our few experiments bore out this expectation to some extent. With lime as a diluent, larvae were found to be absent after dusting on an average of three days; after dusting with stearates as diluents, the larvae were not found present until an average of five to six days. The results obtained warrant further experiments along this line. The report of these experiments was published in the Public Health Reports of October 25, 1929.

The fact that we are receiving reports of malaria from localities heretofore free from this disease is worthy of more than passing interest to this body. It seems that in view of this we should all give more consideration to the control of Anopheles breeding whether we have malaria present or not. So long as Anopheles mosquitoes continue to be present we have hanging over our heads the potential danger of an epidemic of malaria.

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†Past Assistant Surgeon, U. S. Public Health Service, Medical Officer in Temporary Charge, Field Investigations of Malaria.

THE AIMS AND OBJECTIVES OF THE GULF AND SOUTH ATLANTIC ANTI-MOSQUITO CONGRESS*

By HON. HARRY T. HARTWELL,†
Mobile, Ala.

The little pest, known as the mosquito, has for generations annoyed and punished the people along the South Atlantic and Gulf Coast section of this country, and its destruction has been a problem which has baffled many peoples through the ages.

Along the Jersey Coast, and down through the Carolinas, a determined effort has been made to eliminate it without much success and efforts have been made along the coastal regions of the Gulf and South Atlantic with this aim in view. Our Government has to some degree aided this cause, and from all of this work came the creation of the Gulf and South Atlantic Anti-Mosquito Congress. The first meeting for considering ways and means for eradicating the mosquito pest was called in New Orleans, Louisiana, October 2, 1925, by the late Mayor Martin Behrman. The result of this meeting brought about a later meeting in Mobile, after which a conference was called in New Orleans to effect the permanent organization of the Gulf and South Atlantic Anti-Mosquito Congress. This Congress is made up of representatives of eight of the Southern states, namely: North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas, many of which attended the Conference in New Orleans. Our aim and objective is thorough cooperation with a view of destroying the mosquito throughout

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-Third Annual Meeting, Miami, Florida, November 19-22, 1929.

†Mayor of Mobile, Alabama, and President, Gulf and South Atlantic Anti-Mosquito Congress.

the coastal regions of the South Atlantic and Gulf of Mexico territory. Our Congress has already called upon the Senators and Congressmen from the eight states represented in our Congress for National aid and in almost every instance, assurances were received that an effort would be made in the Sixty-first Congress, assembling in December, to have sufficient funds appropriated for the United States Public Health Service to go forward with a detailed survey of conditions. This survey will be followed up by an intensive drive, and it is the intention of the various members of our Congress to ask the state legislature of the various states whose interests are involved as well as the counties and cities affected by this movement to contribute funds for the prosecution of the work. In this manner we hope to obtain sufficient money eventually to eliminate the mosquito from this section of our country.

In the South Atlantic and Gulf states, from Virginia to Texas, both inclusive, there are vast tracts of low-lying lands that are wet and covered more or less by tides. These constitute the "salt marshes." In these states there are 5,600,000 acres of salt marshes, in round numbers as follows: in Alabama, 34,000; Florida, 680,000; Georgia, 329,000; Louisiana, 3,381,500; Mississippi, 26,000; North Carolina, 427,000; Texas, 315,000; Virginia, 206,000. From these figures it will be noted that within the State of Louisiana there is 58 per cent of the total salt marsh acreage of the South Atlantic and Gulf states, and it is of interest to know that in that State are half of the salt marshes of the United States.

To one unfamiliar with problems of this nature, these enormous figures might discourage support of the efforts at control. Although there are millions of acres of salt marshes in the South Atlantic and Gulf states, the Public Health Service feels that the task of control is not a hopeless one. In the first place, the preliminary survey by the Government has brought out the fact that the character of the marshes varies widely and that only a few of them are actual, or even potential, breeding areas. In many sections vast expanses of marshes are daily covered at high tides. These are not producers of mosquitoes. Consequently, one of the first objectives of the survey was the classification of the marshes according to tidal and other influences which bear a direct relation to salt marsh mosquito production.

With the limited funds at the command of Dr. T. H. D. Griffitts, United States Department of Health, who conducted the survey, the short time and a coastal zone extending from Norfolk, Virginia, to Brownsville, Texas, in which to determine "the exact breeding places of the salt marsh mosquitoes," it was necessary to conduct the survey along definite lines, namely: selection of (a) certain more or less typical areas in which to conduct intensive studies of the species of mosquitoes, their egg laying habits, larval development, flight habits and conditions influencing these; character of soils and vegetation; influence of tides and climatological conditions; natural aquatic and aerial enemies; larvicides and other methods of control under varying conditions, and (b) more or less rapid surveys in marsh areas over the whole coastal territory and the collection and compilation of reliable data from all available sources relating to the problems of different regions. For the studies in detail, most of the work has been conducted from the field headquarters of the survey at Biloxi, Mississippi, while other intensive studies have been carried on at points in Florida and North Carolina, and at present in one point in Louisiana.

Time will not permit, in this brief paper, to dwell upon the mass of information already obtained by the preliminary survey. However, it will be in place to take up something of the types of mosquitoes, their habits, some suggestions as to control measures and the interests concerned in the problems when the permanent survey begins.

DISCUSSION (*Abstract*)

Dr. George N. MacDonell, Miami, Fla.—I should like to ask to what extent *Anopheles atropos* is found in this salt marsh area and to what extent it has proven to be troublesome.

Dr. T. H. D. Griffitts, Albany, Ga.—*Atropos* was found breeding more or less profusely in parts of salt marshes in Alabama, Mississippi and Louisiana. It was not found in this survey outside of these three states. It is strictly a salt marsh mosquito, breeding in salt water of a salinity as high as 17 per cent. No work has been done on its ability to transmit malaria. There has been no experimental work carried on. It has a habit of getting into occupied houses and, like *quadrimaculatus*, can be found at distances of one mile from the breeding ground.

We had intended to carry on transmission experiments in 1927 in cooperation with Dr. Barber, but just at that time a proper gametocyte carrier could not be found.

Southern Medical Journal

JOURNAL OF THE
SOUTHERN MEDICAL ASSOCIATION

Published monthly by the Southern Medical Association, Empire Building, Birmingham, Ala. Annual subscription $4.00. Single copies 35c each.

Entered as second-class matter at the Post Office at Birmingham, Ala., under Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1106, Act of October 3, 1917, authorized December 20, 1921.

M. Y. DABNEY, M.D., Editor
EUGENIA B. DABNEY, M.S., Assistant Editor
C. P. LORANZ, Secretary-Manager

Vol. XXIII May 1930 No. 5

EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Twenty-Fourth Annual Meeting
Louisville, Kentucky, November 12-14, 1930
Pre-Meeting Clinics, November 11, 1930

MALARIA IN THE SOUTH

From 1917 to 1921, all the Southern states made notable progress in the control of malaria and its eradication from urban communities. Much of this was accomplished with technical and financial assistance from the United States Public Health Service and the Rockefeller Foundation.

Economic considerations at that time prevented any very serious endeavors to extend the same practices to the rural regions. Despite this neglect, however, malaria for a period of several years following 1921 underwent a steady decline over the South. It was realized that the decrease was more extensive than could be credited to control efforts, and some public health workers, optimistically inclined, felt that malaria in the South was about to exhibit a spontaneous exodus, such as it generally manifested in the states to the north of the Ohio in the last Century.

Events of the last three or four years indicate that such optimism is unfounded, for in several of the Southern states, and even in Illinois, the incidence has increased to the alarm of those conversant with the situation. The menace imperatively demands that any apathy toward the malaria problem, or any feeling that it is well on the road to spontaneous solution, be thrown off.

That malaria can be almost completely eradicated is shown in Panama, where, under ideal conditions of control in a highly malarious district, the rate has dropped from 821 per thousand in 1906 to very nearly nothing in 1928.[1] In certain parts of southwest Georgia, malaria is estimated to have increased in recent years as much as 30 per cent.[2]

Fortunately, several recent advances in the technic of malaria prevention now place health workers in a position to deal with rural malaria on an economical and practical basis. Furthermore, whole-time county health departments, the most effective agencies for the execution of such activities, are now in more general existence.

This issue of the JOURNAL contains a number of papers from which the malaria situation in different parts of the Western hemisphere may be estimated. The most effective recent methods of control are discussed and the new drug, plasmochin, is further evaluated.

The present malaria situation, it is said by physicians who have studied it, is a challenge to every state health department in the South. Regardless of any possible assistance from outside cooperating agencies, the local health organizations must muster all their resources for the application of the measures adapted to their circumstances and needs.

ALUMINUM IN PLANTS AND ANIMALS

Aluminum is the most common substance of which kitchen utensils are made, and since it is frequently found in baking powders, it is probable that minute quantities are regularly ingested, and that these are not notably harmful. In large quantities, 5 to 8 grams per kilogram for guinea pigs and rabbits, it is acutely poisonous. It then causes changes in the blood like those from lead poisoning and death in two

1. J.A.M.A., 92:1610, 1929.
2. Griffitts, T. H. D.: Malaria Control by the Use of Paris Green. S.M.J., this issue, p. 428.

to eleven days. The outstanding pathological effects are injury to the liver and to the convoluted tubules of the kidney.

Underhill and Peterman[3] of Yale have undertaken a study of the distribution of aluminum, having developed a new micromethod for determining it in small quantity. They have investigated its occurrence in plant and animal tissues. It is present in plants, more particularly in the hydrophytes, the roots of which are reservoirs for it. Seeds and blossoms have some aluminum, and it seems to be related to germination and to the flower color. Bird feathers have appreciable quantities. It is beneficial in low concentrations for plants. It was found in greatest quantity in cherries, onions, lettuce, milk, flour, and calf and pig liver.

The blood of dogs which had fasted for seven days contained a demonstrable quantity of aluminum, which did not diminish during the fast, indicating that there had been previous storage of the metal in the tissues. The liver, kidney, brain, and spleen store it.

The bile is very rich in aluminum and is the chief path of excretion. About 0.3 gram of aluminum per day are excreted in the bile and it is also excreted by the kidneys.

The amount stored in the tissues increases with age in dogs and in humans. It is probable that very small quantities are normally present in all plants and animals, and they have perhaps a function. Small quantities of several of the heavy metals have been shown to participate in vital activities. Whether the increasing storage of aluminum with age has anything to do with the symptoms of senescence, one can but guess. Perhaps aging is merely the accumulation of many metabolic products in a body equipped to detoxify small quantities of them.

INCREASING THE RATE OF OVULATION

In the business of producing eggs and chickens for the market, large scale methods have proven practical and profitable. One sees now in poultry and farm journals pictures of many-storied apartment houses in which thousands of hens are confined day and night to prevent their scratching in infected soil and to facilitate feeding and egg collection. Turkeys are now also raised successfully from the egg to the Thanksgiving table size in confinement. It would not have been dreamed a few years ago that an abundant, uniform, edible product could be turned out from poultry establishments of this kind, which closely approach the factory design.

In poultry raising the newest scientific principles of feeding are eagerly used. The houses are kept lighted and the hens are induced to rise early in winter and eat and lay. Cod liver oil is a regular part of the ration, ultraviolet radiation is frequently used, and both these have been shown to increase egg production. Cod liver oil is now given to hens by commercial poultrymen more regularly than it is given to human babies or to gestating women.

Sheard and Higgins,[4] of the Mayo Foundation, have compared the influence of cod liver oil and of filtered and unfiltered sunlight at different times of the year upon the egg output of white Leghorn hens. In three groups of hens studied, one under window glass with cod liver oil, one under window glass without cod liver oil, and one under vitaglass, they found winter eggs most abundant from the group which received cod liver oil. Egg production from the hens kept under vitaglass, which allows the transmission of ultraviolet light, increased with the increase of the ultraviolet component of sunlight in the spring. The presence or absence of the antirachitic factor, either ultraviolet light or vitamin D, Sheard and Higgins found to influence largely the production, fertility and hatchability of hen eggs. There is good evidence that the antirachitic factor thus by some indirect action stimulates the reproductive apparatus of fowls.

There is a more direct method of increasing egg production of certain living things which poultrymen have not yet tried. It is presumably a hormonal action of the anterior lobe of

3. Underhill, F. P.; and Peterman, F. I., et al: Studies in the Metabolism of Aluminum. Amer. Jour. Physiol., 90: pp. 1, 15, 40, 67, 72, 76, 1929.

4. Sheard, C.; and Higgins, G. M.: Effects of Winter Solar Irradiation and of Cod Liver Oil on Production and Fertility of Eggs. Proc. Soc. Exper. Biol. and Med., 27:467, Feb., 1930.

the pituitary gland. In several species of lower animals, egg laying has been studied after implants of the anterior lobe of the pituitary gland. Such transplants hasten sexual maturity in rats, mice and other animals, whose ovaries then contain an excessive number of mature follicles. The anterior pituitary transplants bring about superovulation. Egg laying, mating and subsequent development of fertilized eggs in autumn, instead of in spring, have been induced with several species. Adams,[5] of Mount Holyoke, attempted to discover whether a species of urodeles, amphibians, would deposit eggs out of season after they had received transplants of the pituitary gland. In October whole glands were grafted in a number of females, and eggs were laid by all of them. The females deposited their eggs after engrafting of the whole pituitary, or of the anterior lobe alone, from male animals as well as from females. The anterior lobe of male animals thus stimulated female sex function. Posterior lobe, muscle and thyroid gland, separately, were grafted into control animals, which did not subsequently lay. The anterior lobe of the pituitary was thus shown to stimulate egg production out of season.

The technic of daily transplants of anterior pituitary lobe is of course difficult. Collip,[6] of Montreal, has produced from the placenta a crystalline substance which, when taken orally or by injection, seems to have the same effects as the anterior pituitary transplants of hastening maturity and stimulating ovulation in rodents. Whether it is effective in all species is not yet known.

One wonders whether this will be the direction of the next improvement in the system of egg raising for the city market. Will the anterior pituitary hormone be added to the diet to increase the number of salable hen eggs? By this means egg production might be increased at the expense of every other function of the hen, and eggs might be poured out with the chemical accuracy of the organic dyes, or higher synthetic compounds. Certainly this is not far from the realm of possibility.

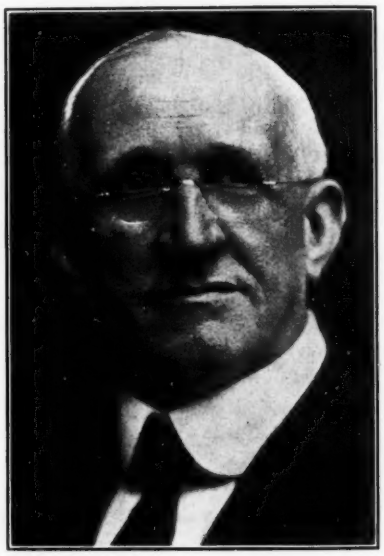
5. Adams, A. E.: Egg Laying in Triturus Viridescens Following Pituitary Transplants. Proc. Soc. Exper. Biol. and Med., 27:467, Feb., 1930.

6. Collip, J. B.: Ovary Stimulating Hormones of the Placenta. Ca. Med. Ass'n. Jour., 22:215, Feb., 1930.

DR. G. C. SAVAGE—IN MEMORIAM

In 1909, during the second annual meeting of the Southern Medical Association in Atlanta, Dr. Giles Christopher Savage, of Nashville, was elected President, succeeding Dr. B. L. Wyman. Dr. Savage presided over the New Orleans meeting, the third annual meeting of the Association, in 1910, twenty years ago.

Dr. Savage was born in Mississippi in 1854, and was graduated from Jefferson Medical College in Philadelphia in 1878. After having studied in London and Vienna for two years, he



established himself in Tennessee. He later specialized in diseases of the eye, and in 1886 accepted the professorship of ophthalmology at Vanderbilt Medical School, in Nashville, which position he held until 1911. He then devoted his time, other than that required for a large practice, to the writing of medical and religious books. He was one of the notable deeply religious scientists.

Dr. Savage was, as his early presidency implies, a founder and organizer of the Southern Medical Association. He has contributed to medical literature several text books on oph-

thalmology which have had considerable circulation and have been translated into foreign languages.

For many years he has occupied a leading place in medical circles. He has been Vice-President of the American Medical Association and Chairman of its Section on Ophthalmology, as well as President of the Southern Medical Association.

He died in Nashville of pneumonia after a short illness on the morning of April 8, the opening date of the Centennial meeting of the Tennessee State Medical Association, an Association he had served long and faithfully. Members of the Southern medical profession will be genuinely grieved to learn of his death.

Louisville—Where We Meet

THE CONVENTION CITY AND ITS VICINITY*

Louisville, the metropolis of Kentucky, stretching along an eight mile crescent of the Ohio River, is one of those American cities which has a charm peculiar to itself. It is true that the "sun shines bright in My Old Kentucky Home," and it is true also that the very nature of Kentucky, its proverbial hospitality, has made that song beloved of all America.

The founding of the metropolis of Kentucky is entwined with one of the most adventurous episodes in American history. There General George Rogers Clark established his base of supplies on the occasion of his expedition resulting in the winning of the vast Northwest by the United States. General Clark's body lies within the confines of Louisville in the nationally famed Cave Hill Cemetery, noted for its botanical garden-like scope in landscaping and beauty of surroundings. The city was chartered in 1779 by the Virginia Legislature, when Kentucky was a part of that State.

Louisville is connected with early American history by still another tie. Near the city limits may be seen the tomb of Zachary Taylor, twelfth President of the United States, located on the grounds of the former homestead of the ex-President. In this home, still standing, President Taylor's daughter was married to Jefferson Davis, the only President of the Confederacy, who was also a native of Kentucky.

Louisville is a friendly city; in fact, it has become a byword that "when you're in Louisville, you're among friends." Louisville has grown to a metropolitan center with a population of approximately 340,000 persons, but the city still retains those things that have given Louisville its charm. If you walk through its busiest streets you will probably see along the sidewalks groups of citizens who have taken the time to stop and chat a few moments. Life is not too hurried; in Louisville you will find that spirit of enjoyment of living which, while getting things done, still takes time to enjoy itself. And there are probably many little colloquialisms in Louisville that the City sticks to which will amuse the visitor. For example, if you stop to ask a resident a question concerning direction, you will more than likely receive the answer, "out, in, down or up the street," depending upon the direction. You will understand that those terms mean a definite thing in Louisville. From time beyond which the memory of the oldest inhabitant runneth not to the contrary, "out" has meant south, "in" has meant north, "down" has meant west, and "up" has meant east.

Louisville and Kentucky are, of course, to the visitor, synonymous with horse racing and tobacco. In an earlier day there was a third substance called to mind with the mention of Kentucky, but of course that day is passed. But in the words of General James Tandy Ellis, famed Kentucky humorist, "Kentucky is still made the scene of every story concerning liquor ever invented." General Ellis tells a story concerning an inquisitive resident of a sister state who asked him if it were true, as reported, that every house in Kentucky still had liquor in it. General Ellis replied:

My Old Kentucky Home where Stephen Collins Foster wrote the immortal song of the same name and many of his famous melodies. It is preserved just as it was in his day and is a shrine visited annually by a number exceeded only by the visitors to Mount Vernon.

*Prepared by the Louisville Convention and Publicity League, Harry G. Evans, Secretary and Managing Director.

"They say the rich folks still have a little, and the poor folks have a little still." Concerning horse racing, the visitor will find here one of the most beautiful race courses in the world. Beautiful Churchill Downs is exceeded only in its attractiveness by its popularity. The visitor is welcome to visit Churchill Downs at any time of the year. Above the facades of the various buildings he will note a series of names. This is the honor roll of thoroughbreds which have been successful in the Derby. Horsemen will vie more for the honor of being represented there than for the small fortune which goes to the winner. Regarding tobacco: when it is realized that one-third of the world's tobacco crop is raised in Kentucky the importance of Louisville as a tobacco market can be understood. The "Tobacco Breaks," as the tobacco marketing district is known, furnishes a picturesque scene, with its spirited bidding by representatives of all large tobacco manufacturing companies and of foreign governments.

Louisville's park system is known throughout the United States as one of the best planned in the Country. Every type of scenic beauty from virgin forest and river views to landscaped vistas may be enjoyed on the thirty-two miles of parkway boulevards extending through the principal preserves. Another feature of the park system that will interest the visitor is the number of small playground parks scattered throughout the City.

The charm of running water makes the Ohio River an ever-interesting point for visitors to Louisville. The Ohio, however, does not only attract; it holds the visitor in the charmed spell it casts. High wooded hills on one side of the river are accentuated by sand beaches on the other. A trip on the Ohio takes the visitor through delightful and refreshing Kentucky scenery. And at night no more peaceful scene can be imagined than the softly flowing waters hemmed in by shadowy and indefinite banks with the bright Kentucky moonlight casting its ribbon on the blue-black surface.

The country around Louisville offers opportunity for varying desires. The visitor may visit the Bluegrass regions, the mountain country or the cave sections. And interesting objectives will be found in each division. Scenic tours comparable to anything to be found in America may be enjoyed in the Kentucky mountains.

The Bluegrass holds the stock farms and the famed race horse breeding establishments. On the border of this country, about forty miles from Louisville, the visitor will find Bardstown. There is "My Old Kentucky Home," the old Rowan homestead where Stephen Collins Foster was inspired to write the immortal "My Old Kentucky Home," and where he penned most of his loved melodies. The typical Colonial homestead is preserved just as it was when Foster visited his uncle, Judge Rowan, and has been dedicated as a State shrine. There the guide will show the visitor the place, telling some of his fund of stories connected with the home. For example, he will show the spring, which he says dried up, and the mint bed, which died out on the day prohibition became a law. Thus Nature responded to the uselessness of producing its share of the ingredients to the mint julep when the Government prohibited the other part of the mixture. There also is St. Joseph's Church, in which are kept a half dozen old masters' paintings, the gift of King Louis Phillipe of France, who spent part of his exile near Bardstown. Upon his restoration to the throne of France he showed his appreciation of the hospitality extended by Bardstown by presenting this art collection, valued at over a million dollars, to Bishop Flaget, the first Catholic bishop west of the Alleghenies.

A little further on than Bardstown; twenty miles, near Hodgensville, is the log cabin in which Abraham Lincoln was born. It is preserved, on the identical spot where it stood at that time, in a granite memorial building. The country hereabouts is rich in scenes connected with the boyhood life of Lincoln.

Another place of international fame, within easy reach of the convention city, is Mammoth Cave. This entrancing underground cavern, with its 150 miles of chartered passages, annually attracts thousands of visitors. It transports the visitor to a different world. In it, among the things to be seen, are Echo River, the underground mystery stream in which are found eyeless fish; the star chamber, in which the mineral formations in the vaulted chamber give the illusion of a star-lit sky; seemingly bottomless pits; cathedral like spaces and mineral formations akin to architectural creations. Mammoth Cave is the largest of the caverns found in the cave regions, but so interesting is this entire section that the United States has accepted the proposition to make this section of the State a National Park and recent action of the Kentucky Legislature assured the funds for this purpose.

The mention of these places will serve to let the reader know what type of country he will visit. Future editions will elaborate on the many attractions in and about Louisville, which assure a most delightful combined vacation and convention trip this year. But, above all this, the visitor will find old-fashioned Kentucky hospitality awaiting him.

Book Reviews

Rickets, Including Osteomalacia and Tetany. By Alfred F. Hess, M. D., Clinical Professor of Pediatrics, University and Bellevue Hospital Medical College, New York, N. Y. 485 pages, illustrated with 52 engravings. Philadelphia: Lea and Febiger, 1929. Cloth, $5.50.

This book reveals an infinite amount of research work, both clinical and in the laboratory. Dr. Hess is an authority on rickets. Although the book is highly technical in places, it also gives ample details for the average physician. Irradiated ergosterol or viosterol is fully discussed. The volume gives the latest information on rickets, tetany and osteomalacia.

The Hebrew Physician. Published by the Hebrew Medical Journal, 983 Park Avenue, New York City. Chairman Publication Committee, Moses Einhorn, M.D.

"The Hebrew Physician" is a recent publication from New York in Hebrew script. Doubtless the many well-trained Jewish physicians in America and abroad will be interested readers and contributors. The journal, in so far as it is successful, will have the unfortunate effect of segregating Jewish from gentile science. Jewish physicians in this Country read English readily and gentile physicians do not read Hebrew. Gentiles will regret, therefore, that the contents are apparently needlessly closed to them.

Practical Massage and Corrective Exercises with Applied Anatomy. By Hartvig Nissen, Late President of Posse Normal School of Gymnastics; Superintendent of Hospital Clinics in Massage and Medical Gymnastics; For Twenty-Four Years Lecturer and Instructor of Massage and Swedish Gymnastics at Harvard University Summer School. Fifth Edition, Revised and Enlarged by Harry Nissen, President, Posse-Nissen School of Physical Education, Boston, Mass. 271 pages with 72 original half-tone and line engravings. Philadelphia: F. A. Davis Company, 1929. Cloth, $2.50.

This manual describes with excellent detail the usual movements of massage and medical gymnastics. It may be criticized from the viewpoint of the physician reader as basing rather broad statements regarding the beneficial effect of the advocated forms of treatment upon a questionable understanding of physiology and pathology. It is intended to be useful to the physician's assistant. However, the physician would not care to have her quote from the book to a patient.

The author, an authority upon massage, has written a book which is too enthusiastic to conform to the usual standards of medical literature, but which is, nevertheless, a very good exposition of the subjects of massage and exercise.

Disease and the Man. By George Draper, M.D., Associate Professor of Clinical Medicine, Columbia University. 270 pages, illustrated. New York: The Macmillan Company, 1930. Cloth, $4.50.

This book is based upon observations of facial, dental and body structure of persons suffering with various maladies. One page contains a schematic representation of five morphological types of faces, emphasizing the basic proportional differences. Facial proportions of one type Dr. Draper describes as particularly susceptible to nephritis and hypertension. There is a tuberculosis type, a gastric ulcer type, a gall bladder type, and a pernicious anemia type. The author has published many previous contributions along the same line.

The psychological panel of disease is also discussed: the fright which may cause ulcer or other clinical conditions. This aspect of disease is perhaps over-emphasized.

The volume is not long; it contains many illustrations; and it is a contribution to medical lore. It will be interesting also to the laity, since every one likes to speculate upon the type to which he himself belongs.

The Neck. By Percy D. Hay, Jr., M.D., with an Introduction by Henry K. Pancoast, M.D. Volume Nine of Annals of Roentgenology, a Series of Monographic Atlases, edited by James T. Case, M.D., ex-President of the American Roentgen Ray Society. 104 pages, illustrated. New York: Paul B. Hoeber, Inc., 1930. Cloth, $8.00.

Dr. Hay, in his work on the soft tissues of the neck, has given us an admirable interpretation of the normal neck, based upon the structural anatomy of the part as well as some of the pathological conditions and their roentgenological appearance.

In the first section of the book he describes the technic and classifies the 203 cases included in his study. The classification consists of normal necks of adults, 50; normal necks in infants and children, 25; and the pathological cases 128.

In the discussion of normal necks of adults he gives a detailed description of the pharynx, larnyx, cervical trachea and cervical esophagus as found in the roentgenogram. In the group of 25 necks of children, he points out the variations and differences as compared with adults. In the study of pathological necks he includes the following conditions: non-specific inflammations, abscesses of the neck, tuberculous infections, salivary calculi, syphilitic infections, diphtheritic infection, streptococcic laryngitis, thyroid cases, benign tumors, malignant tumors, diverticula of the pharynx, neuromuscular conditions, traumatic cases, and foreign bodies.

In the appendix he discusses the differential diagnosis of upper respiratory lesions in suspicious thymic cases; upper respiratory phenomena associated with bulbar paralysis; and studies of acquired speech mechanism following laryngectomy.

The value of the text is greatly enhanced by the profuse and well chosen illustrations.

A review of the book would not be complete without mention of the scholarly introduction of Dr. Pancoast, in whose department this work was done.

This monograph is a real addition to medical literature and should be of great value to the laryngologist and roentgenologist.

Practical Psychology and Psychiatry. For use in training schools for attendants and nurses and in medical classes, and as a ready reference for the practitioner. By C. B. Burr, M.D., Late Medical Director, Oak Grove Hospital, Flint, Mich., for Mental and Nervous Diseases. Sixth Edition, Revised and Enlarged. 378 pages, illustrated. Philadelphia: F. A. Davis Company, 1930. Cloth, $2.75.

The first and last impression obtained from this book is that the author is educated and a philosopher. In the section devoted to practical psychology, there is a tendency to stress the limitations of the knowledge of this subject and there is a cynicism in his discussion of behaviorism. The section on psychiatry is clear and well presented. The subdivision on the prevention of insanity and mental hygiene is worthy of special mention. For the nurse who has a college education the book seems useful if supplemented by lectures; for the high school graduates, it would prove a labyrinth of mental confusion. The book is so well written that one reads it with pleasure, although at times it partakes of the style of Cicero's denunciations in attacks upon those with whom the author disagrees.

Symptoms of Visceral Disease. A Study of the Vegetative Nervous System in its Relation to Clinical Medicine. By Francis Marion Pottenger, A.M., M.D., LL.D., F.A.C.P., Medical Director, Pottenger Sanatorium for Diseases of the Lungs and Throat, Monrovia, California. Fourth Edition. 426 pages with 87 text illustrations and 10 color plates. St. Louis: The C. V. Mosby Company, 1930. Cloth, $7.50.

There have been four editions of this book since its publication in 1919 and the present edition is revised and, in parts, amplified. The author has presented a complete study of the vegetative and nervous system and through its physiology and pathology has endeavored to explain the symptoms of visceral disease. The study of this book will repay any reader for, although in parts there are statements that are controversial, as the relation of antigens to asthma which the author does not accept, yet there are many valuable sections. There are many illustrations and diagrams in the text, some of which are original and all are well selected. The extensive bibliography that follows each section shows the effort expended in the book's production.

Modern Methods of Treatment. By Logan Clendening, M.D., Professor of Clinical Medicine, Lecturer on Therapeutics, Medical Department of the University of Kansas, with chapters on special subjects by H. C. Andersson, M.D.; J. B. Cowherd, M.D.; H. P. Kuhn, M.D.; Carl O. Rickter, M.G.; F. C. Neff, M.D.; E. H. Skinner, M.D.; and E. R. DeWeese, M.D. Third Edition. 815 pages, illustrated. St. Louis: The C. V. Mosby Company, 1929. Cloth, $10.00.

This volume covers adequately in an outline form the various methods of treatment used in internal medicine. Besides the discussion of management and of treatment of the common run of diseases, both infectious and degenerative, there are chapters on physiotherapy, dietetics, infant feeding, hydrotherapy, heliotherapy and radiotherapy. Various miscellaneous procedures such as blood matching and lumbar punctures are amply illustrated. About one-fourth of the book is devoted to drugs, their pharmacology and their use in disease. The author says that even though the most effective therapeutic procedures are rest and surgery, drugs are the mainstay of treatment. The physician who knows how and where to use them will appreciate their real worth.

The work is well written and compact, giving suggestions on treatment of practically every conceivable medical disease. It is a product of a scholar and a man of keen clinical judgment.

The Diagnosis and Treatment of Chronic Diseases of the Respiratory Tract, with Especial Reference to the Lesions of the Trachea, Bronchi, Lungs, Pleura, and Diaphragm. By Elmer H. Funk, M.D., Clinical Professor of Medicine and Therapeutics, Jefferson Medical College, Philadelphia, Penn. Volume V of Oxford Monographs on Diagnosis and Treatment, edited by Henry A. Christian, M.D., Sc.D., LL.D., Hersey Professor of the Theory and Practice of Physic, Harvard University, and Physician-in-Chief, Peter Bent Brigham Hospital, Boston, Mass. 618 pages, illustrated. New York: Oxford University Press, 1929.

The compilation of this book by Dr. Funk is a very real addition to the modern literature on the subject of chronic diseases of the respiratory tract.

The book is replete from the first to the last page with the newer knowledge on the subject. There is nothing superfluous anywhere within the book. The reader regrets that Dr. Funk did not include the acute as well as the chronic diseases of the respiratory tract. American medical literature contains too few books of this kind.

Psychology, Normal and Abnormal with Special Reference to the Needs of Medical Students and Practitioners. By James Winfred Bridges, Ph.D., Professor of Psychology in the Faculty of Medicine, McGill University. 552 pages. New York: D. Appleton & Co., 1930. Cloth, $3.50.

The book is written to fill a want for a text on psychology adapted to the needs of medical students and physicians. The author presents the main facts and theories of normal and abnormal psychology and correlates these as far as possible with the actual and assumed functions of the nervous system. The text is based upon the double aspect theory of the mind-body relation, and thus the behavioristic and introspective methods are recognized. He thus reconciles the teachings of the different schools and presents the important findings and significant doctrines of each. Functional and structural psychology, behaviorism and psychoanalysis, are clearly given.

Physiology is correlated with the facts and theories of psychology, which makes previous knowledge of neurology an asset in understanding the book. But adequate space is given to the behavior mechanism to make the book understandable to the layman. Abnormal mental processes and behavior are described with the normal. There is no supposition that the reader knows normal psychology, but the aspects of most interest to the physician are stressed. The author tries to keep his book within definite limits and not to invade other related fields. The physician will be well repaid by studying the book.

A Diabetic Manual for the Mutual Use of Doctor and Patient. By Elliott P. Joslin, M.D., Clinical Professor of Medicine, Harvard Medical School; Consulting Physician, Boston City Hospital; Physician to New England Deaconess Hospital, Boston, Mass. Fourth Edition, Thoroughly Revised. 248 pages, illustrated. Philadelphia: Lea & Febiger, 1929. Cloth, $2.00.

In the fourth edition the author tries to develop three thoughts: first, that the patient can master his disease if he so wills; second, that his own length of days after his diabetes begins is in some degree a measure of the success he achieves; third, that he has an excellent chance of living long and well.

With this spirit of optimism the author undertakes to give to the patient and to the physician the fundamental principles of the management of diabetes.

To the physician this manual is heartily recommended because it answers the most important questions dealing with the management of this disease. To the patient it offers in as simple a language as possible advice, education and guidance.

The Volume of the Blood and Plasma in Health and Disease. By Leonard G. Rowntree, M.D., and George E. Brown, M.D., Division of Medicine, the Mayo Clinic and the Mayo Foundation, Rochester, Minnesota, with the Technical Assistance of Grace M. Roth. 12 mo., 219 pages, illustrated. Philadelphia and London: W. B. Saunders Co., 1929. Cloth, $3.00 net.

The authors have summarized the results of their fifteen years of investigations in this volume. The first four chapters are concerned with methods and in them are presented data which support their view as to the desirability of the dye method. In subsequent chapters data on normal subjects and on patients with various metabolic, circulatory and hematopoietic diseases are presented. The bibliography is rather complete. This is a desirable book for anyone who is interested in the pathological physiology of diseases of the heart, blood vessels and of the blood.

The Essentials of Histology, Descriptive and Practical. For the Use of Students. By Sir Edward Sharpey Schafer, F.R.S., Professor of Physiology in the University of Edinburgh. Twelfth Edition. Revised by the author, with the cooperation of H. M. Carleton, Ph.D., Lecturer on Histology in the University of Oxford. 628 pages, illustrated. Philadelphia and New York: Lea & Febiger, 1929. Cloth, $5.00.

This book has been an accepted standard since the appearance of its first edition in 1885. The subject is well handled and the present edition brings the book up to date. It is destined to be a favorite in teaching institutions and can be studied with advantage by the practising physician.

Southern Medical News

ALABAMA

The Garner Memorial Hospital, Anniston, was opened April 1. The Hospital is municipally owned and cost more than $100,000.

Dr. J. A. Norris, Health Officer of Baldwin County, has resigned and has removed to Gulfport, Mississippi, where he will be connected with the Veterans' Hospital Bureau.

Dr. John Chason, Bay Minette, has been appointed Health Officer for Baldwin County.

Deaths

Dr. J. W. Moon, Birmingham, aged 53, died April 9 of heart disease.

Dr. James Ware Ray, Montgomery, aged 50, died February 7.

ARKANSAS

The annual meeting of the Arkansas State Medical Association will be held at Fort Smith on May 6, 7 and 8.

The Arkansas County Medical Society has elected the following officers for 1930: Dr. S. A. Drennen, Stuttgart, President; Dr. A. Fowler, Humphrey, Vice-President; Dr. E. B. Swindler, Stuttgart, Secretary.

The Dallas County Medical Society has elected the following officers for this year: Dr. H. H. Atkinson, Fordyce, President; Dr. H. A. Cheatham, Princeton, Vice-President; Dr. J. E. M. Taylor, Sparkman, Secretary-Treasurer.

The Hempstead County Medical Society has elected the following officers for 1930: Dr. W. M. Garner, Hope, President; Dr. W. P. Parker, Hope, Vice-President; Dr. R. R. Robins, Hope, Secretary-Treasurer; Dr. J. H. Weaver, Hope, Delegate; and Dr. G. E. Cannon, Hope, Alternate.

The Howard-Pike County Medical Society has elected the following officers for this year: Dr. E. V. Dildy, Nashville, President; Dr. J. M. Holt, Nashville, Vice-President; Dr. W. Ridley Lee, Mineral Springs, Secretary-Treasurer; Dr. W. H. Toland, Nashville, Delegate; and Dr. J. T. Holcomb, Mineral Springs, Alternate.

The Pope County Medical Society has elected the following officers for this year: Dr. C. J. Ross, Dover, President; Dr. E. P. Griffin, Atkins, Vice-President; Dr. W. P. Scarlett, Russellville, Secretary; Dr. A. B. Tate, Russellville, Delegate; and Dr. E. J. Ross, Alternate.

Dr. I. M. Huskey, formerly of Morefield, has moved to Cave City.

Dr. J. D. Riley, who for the past nine years has been head of the Southern Baptist Sanatorium, El Paso, Texas, has been elected Superintendent of the Arkansas Tuberculosis Sanatorium.

Deaths

Dr. Charles Hastings Cargile, Texarkana, aged 76, died February 13 of arteriosclerosis.

Dr. Fred Thomas Murphy, Brinkley, aged 60, died in February of heart disease.

DISTRICT OF COLUMBIA

The Association of Military Surgeons of the United States chose Col. Bailey K. Ashford, University of Porto Rico, Porto Rico, to deliver the lecture of the Kober Foundation for 1930. The lecture was given on March 28 at Gaston Hall, Washington, and the title was "Significance of Mycology in Tropical Medicine."

The George Washington University Medical Alumni Association held their annual banquet on March 5. Dr. George W. Crile, Cincinnati, addressed the Association on medical progress.

Deaths

Dr. Karl C. Corley, Washington, aged 56, died February 11 of coronary thrombosis.

Dr. Louis Charles Lehr, Washington, aged 54, died February 20.

FLORIDA

Dr. A. J. McRae, Superintendent of the Jackson Memorial Hospital, Miami, announces the following appointments to the medical staff for 1930: Surgery—Dr. R. O. Lyell, Dr. T. W. Hutson, Dr. J. C. Turner and Dr. C. F. Sayles; Medicine—Dr. R. M. Harris, Dr. E. C. Thomas, Dr. E. S. Nichol and Dr P T. Skaggs; Obstetrics—Dr. S. D. Aronovitz, Dr. Homer Pearson, Dr. J. R. Graves and Dr. M. C. Wilson; Eye, Ear, Nose and Throat—Dr. B. H. Palmer, Dr. W. J. Vinson, Dr. C. E. Dunaway and Dr. G. E. Chandler; Urology—Dr. D. W. Harris, Dr. R. J. Holmes, Dr. E. Clay Shaw and Dr. Milton Coplan; Pediatrics—Dr. C. L. Kennon, Dr. G. H. Withers, Dr. W. W. McKibbon and Dr. W. Quillian; Dermatology—Dr. E. D. French and Dr. B. Litterer; Neurology—Dr. G. H. Benton, Dr. P. L. Dodge and Dr. I. H. Agos; Consulting Neurologist—Dr. E. K. Jaudon; Orthopedics—Dr. A. H. Weiland and Dr. D. T. Babcock; Pulmonary Tuberculosis—Dr. M. Jay Flipse; Pathology—Dr. Iva C. Youmans; Roentgenology—Dr. G. Raap and Dr. C. D. Cleghorn; Consulting Roentgenologist, Dr. J. H. Lucinian.

The Florida Public Health Association has elected the following officers for 1930: Dr. T. Z. Cason, Jacksonville, President; Dr. E. C. Gillette, Jacksonville, Vice-President; Mrs. M. L. Stanley, Daytona Beach, Secretary; and G. E. Therry, Jacksonville, Treasurer.

The Dade County Medical Society has elected the following officers for this year: Dr. P. T. Skaggs, President; Dr. R. M. Harris, Vice-President; Dr. E. N. McKenzie, Secretary; and Dr. Nelson T. Pearson, Treasurer; all of Miami.

The DeSoto-Hardee-Highlands County Medical Society has elected the following officers for 1930: Dr. H. P. Bevis, Arcadia, President; Dr. M. C. Kayton, Wauchula, Vice-President; Dr. H. V. Weems, Sebring, Secretary-Treasurer.

The Sarasota County Medical Society has elected the following officers for this year: Dr. T. W. Taylor, President; Dr. J. C. Patterson, Vice-President; and Dr. F. C. Metzger, Secretary-Treasurer; all of Sarasota.

The Florida Medical Association has moved its offices from the State Board of Health Building to 404 Florida Theater Building, Jacksonville.

Deaths

Dr. William J. Calvin, Eustis, died January 22 from accidental gunshot wound while out hunting.

GEORGIA

The Habersham County Medical Society has elected the following officers for 1930: Dr. J. B. Jackson, Clarkesville, President; Dr. P. Y. Duckett, Cornelia, Vice-President; Dr. R. B. Lamb, Demorest, Secretary-Treasurer.

The Lowndes County Medical Society has elected the following officers for this year: Dr. G. T. Crozier, Valdosta, President; Dr. E. J. Smith, Hahira, Vice-President; Dr. B. G. Owens, Valdosta, Secretary-Treasurer; Dr. A. F. Saunders, Valdosta, Delegate; and Dr. C. T. Williams, Valdosta, Alternate.

The Lamar County Medical Society has elected the following officers for 1930: Dr. C. H. Willis, Barnesville, President; Dr. C. E. Rogers, Barnesville, Vice-President; Dr. J. M. Rogers, Barnesville, Secretary-Treasurer; Dr. J. A. Corry, Barnesville, Delegate.

The Chattooga County Medical Society has elected the following officers for this year: Dr. E. M. Jennings, Menlo, President; Dr. M. N. Wood, Menlo, Vice-President; and Dr. H. D. Brown, Summerville, Secretary-Treasurer.

The Floyd County Medical Society has elected the following officers for 1930: Dr. J. H. Mull, Rome, President; Dr. C. H. McArthur, Rome, Vice-President; and Dr. E. J. Radcliffe, Rome, Secretary-Treasurer.

The Burke County Medical Society has elected the following officers for this year: Dr. J. M. Cook, Sardis, President; Dr. J. B. Lewis, Waynesboro, Vice-President; and Dr. W. W. Hillis, Sardis, Secretary-Treasurer.

The Ocmulgee Medical Society has elected the following officers for the ensuing year: Dr. Ernest L. Smith, Eastman, President, and Dr. A. R. Rush, Hawkinsville, Secretary-Treasurer.

The Worth County Medical Society has elected the following officers for 1930: Dr. J. L. Tracy, Sylvester, President; Dr. H. S. McCoy, Sylvester, Vice-President; and Dr. Gordon S. Sumner, Sylvester, Secretary-Treasurer.

The Glynn County Medical Society has elected the following officers for this year: Dr. H. L. Akridge, Brunswick, President; Dr. H. M. Branham, Brunswick, Vice-President; and Dr. F. N. Aldrich, Brunswick, Secretary-Treasurer.

Dr. Homer L. Baker has located at Carrollton to practice.

Dr. J. C. Hind, formerly of Reynolds, is now connected with the Government and is stationed at the United States Veterans' Bureau, Washington, D. C.

Dr. L. H. Kelley, Atlanta, has removed his offices to the Medical Arts Building.

Dr. A. J. Kilpatrick, Augusta, announces the removal of his office to 407 Seventh Street.

Dr. Henry M. McGehee, Atlanta, has been elected School Physician of the Georgia School of Technology.

Dr. A. M. Rountree, formerly of Thomaston, has moved to Reidsville.

Dr. Stuart H. Shippey, Atlanta, has moved his office to 815 Grant Building.

Dr. A. W. Stirling, Atlanta, has severed his partnership with Dr. J. C. McDougall. His office will be at 2594 Alston Drive, S. E., work limited to eye only.

Deaths

Dr. William J. Adair, Rockmart, aged 73, died February 4 of hemiplegia.

Dr. Nathaniel Hawthorne Lang, Waverly, aged 85, died suddenly February 7.

Dr. Clarence Oscar Tye, Edison, aged 57, died February 7 of angina pectoris.

KENTUCKY

The Boyd County Medical Society has elected the following officers for this year: Dr. J. C. Sparks, President; Dr. A. J. Bryson, Vice-President; Dr. J. D. Swango, Secretary; and Dr. H. S. Swope, Treasurer; all of Ashland.

The Caldwell County Medical Society has elected the following officers for 1930: Dr. W. C. Hayden, President; Dr. W. P. Morse, Vice-President; and Dr. W. L. Cash, Secretary-Treasurer; all of Princeton.

The Johnson County Medical Society has elected the following officers for this year: Dr. J. H. Holbrook, President; Dr. C. F. Holtegel, Vice-President; and Dr. P. B. Hall, Secretary-Treasurer; all of Paintsville.

The Pike County Medical Society has elected the following officers for 1930: Dr. R. W. Raynor, President; Dr. Paul Gronnerud, Vice-President; and Dr. A. G. Osborne, Secretary-Treasurer; all of Pikeville.

The Whitley County Medical Society has elected the following officers for this year: Dr. L. L. Terrell, Corbin, President; Dr. B. J. Edwards, Corbin, Vice-President; and Dr. C. A. Moss, Williamsburg, Secretary.

Dr. S. Hays Gailbreath, Louisville, and Miss Blanche Drury Stith, Guston, were married January 24.

Deaths

Dr. Charles L. Heath, Wilton, aged 61, died February 7 of cerebral hemorrhage.

Dr. Walter A. Scroggin, Visalia, aged 71, died February 10 of angina pectoris.

Dr. James A. Van Sant, Mount Sterling, aged 73, died February 6 of pneumonia.

Dr. Murry Hamilton Walker, Owensboro, aged 46, died February 16 of pneumonia.

LOUISIANA

At the recent annual meeting of the Ophthalmological and Otolaryngological Society, New Orleans, Dr. William A. Wagner was elected President and Dr. M. Meyer, Secretary-Treasurer.

The Monroe Medical Clinic, Monroe, has been organized and incorporated and is now erecting a clinic building which is to cost $200,000, with 66 rooms completely equipped. Dr. G. Q. Graves, Dr. A. G. McHenry, Dr. B. M. McKoin, Dr. A. D. Tisdale, Dr. E. J. Young and Dr. M. W. Hunter compose the clinic, and they will have associated with them Dr. Oscar Dowling, who was formerly President of the Louisiana State Board of Health.

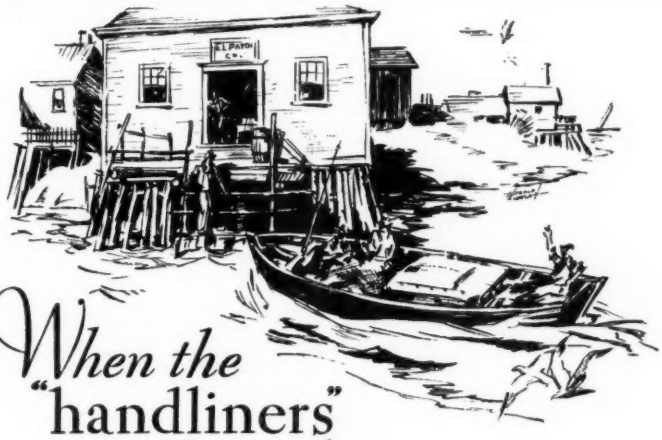
Under the auspices of the Louisiana State Board of Health and the New Orleans Council of Social Agencies, the Southern States Regional Conference and Social Hygiene Institute will be held in New Orleans May 23-27. Round table discussions of technical social hygiene problems have been arranged for May 23 and 24. Two meetings for the general public have been arranged for Sunday, May 25, one of which is to bring together negro leaders. The Regional Conference proper will be on May 26 and 27.

The St. Mary Medical Society has elected the following officers for 1930: Dr. A. C. Kappel, President, and Dr. T. H. Gueymard, Secretary-Treasurer, both of Patterson.

The Avoyelles Parish Medical Society has elected the following officers for this year: President, Dr. Kirby A. Roy, Mansura; Vice-President, Dr. R. G. Ducote, Bordelonville; Secretary-Treasurer, Dr. S. J. Couvillon, Moreauville.

The Beauregard Parish Medical Society has elected the following officers for 1930: President, Dr. J. C. Miller; Vice-President, Dr. S. T. Roberts; and Secretary-Treasurer, Dr. S. O. Turner, all of DeRidder.

(Continued on page 34)



When the "handliners" *call it a day.*

The "small boat" men who go after codfish close to shore come in with their catch every day.

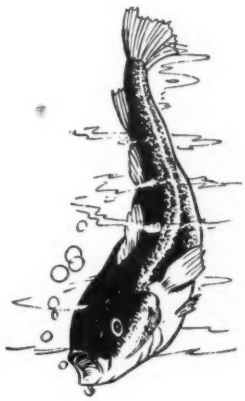
Then the Patch plants reap their harvest of the vitamin A and D bearing livers.

These plants are dotted along the coast line from Cape Cod to Newfoundland. So they make oil from fresh livers of fresh codfish, brought in by the "handliners" as the codfish season swings north and south.

The efforts of these Patch workers augment the work of the men making oil on the deep sea boats, so that you, doctor, may have at your disposal Patch's Flavored Cod Liver Oil with its typical palatability, its richness in both the vitamins A and D which have served you so well for many years.

Abundant clinical experience points to the value of the combined vitamins A and D in stepping up resistance and building up energy in addition to the antirachitic factor.

Patch's Flavored Cod Liver Oil presents these vitamins in standardized dosage and in a very palatable form.



PATCH'S

Flavored Cod Liver Oil

The E. L. PATCH COMPANY

Boston **Mass.**

THE E. L. PATCH CO.
Stoneham 80, Dept. S.M. 5,
Boston, Mass.

Gentlemen:

Please send me a sample of Patch's Flavored Cod Liver Oil and literature.

Dr. .....

Address .....

You Can Stop Thumb-Sucking Easily With BABY ALICE Thumb Guard

Price $1.00 Each

Continued Thumb Sucking *causes the teeth to grow irregularly — jaws and mouth to become deformed — elevation of palate, etc.*

The most persistent case of thumb sucking can be corrected with a *Baby Alice* thumb guard. This improved thumb guard allows free use of the hand at all times and does not cause annoyance or discomfort. The child is not subjected to the use of cloths, bitter liquids, etc., which are not only ineffective but insanitary.

Baby Alice thumb guards are made of rust-proof metal and are shaped to fit the thumb and hand comfortably. They can be easily cleaned and sterilized and kept sanitary. Approved by leading baby specialists.

Ask your dealer today for a *Baby Alice* thumb guard. If he cannot supply you write us direct.

Baby Alice thumb guards are made in several sizes for children of different ages. The sizes and ages given in the table below are average:

Size	Age
No. 1	1 - 1½ years
No. 2	1½ - 2½ years
No. 3	2½ - 3½ years
No. 4	3½ - 4½ years
No. 5	4½ - 5½ years
No. 6	5½ - 6½ years

Special guards made to order. Send pencil outline of hand and wrist—with finger indicated, and give the age of the child.

McKesson-Bedsole-Colvin-O'Dell, Inc.

Department of Surgical Instruments,
Hospital Supplies, X-Ray Apparatus

1706-1712 First Avenue

BIRMINGHAM, ALABAMA

(Continued from page 478)

The Lafayette Parish Medical Society has elected the following officers for the ensuing year: President, Dr. A. J. Comeaux, Youngsville; Vice-President, Dr. L. A. Prejean, Scott; Secretary-Treasurer, Dr. W. J. Yongue, Lafayette.

The Sabine Parish Medical Society has elected the following officers for the year: President, Dr. W. G. Allen, Converse; Vice-President, Dr. W. P. Perkins, Gandy; Secretary-Treasurer, Dr. D. Harvey Dillon, Many.

The St. Landry Parish Medical Society has elected the following officers for 1930: President, Dr. L. J. Bienvenu, Opelousas; Vice-President, Dr. J. M. Brown, Washington; Secretary-Treasurer, Dr. W. R. Lastrapes, Opelousas.

The Tangipahoa Parish Medical Society has elected the following officers for this year: President, Dr. E. L. McGehee, Hammond; Vice-President, Dr. J. H. Galloway, Pleasant Hill; Secretary-Treasurer, Dr. W. T. Newman, Independence.

The Vermilion Parish Medical Society has elected Dr. Leo Saporito, Kaplan, President, and Dr. H. A. Eldredge, Abbeville, Alternate, for this year.

Deaths

Dr. Joseph J. Frater, Shreveport, aged 68, died February 14.

MARYLAND

Dr. Alexius McGlannan, Baltimore, was honored at a testimonial dinner given recently by the Staff of the Mercy Hospital. Dr. McGlannan is Chief of the Surgical Staff of the Hospital.

Dr. Henricus J. Stander, Associate Professor of Obstetrics, Johns Hopkins University School of Medicine, Baltimore, has been appointed Professor of Obstetrics and Gynecology at Cornell University, and head of these departments in the New York Hospital. Dr. Stander will go to his new post in September and will remain at Johns Hopkins until that time.

The William Sydney Thayer and Susan Reed Thayer Lectures in clinical medicine at the School of Hygiene and Public Health, Baltimore, were delivered by Dr. Oswald T. Avery, of the Rockefeller Institute, New York.

The health officers and boards of health of Maryland will hold the Twelfth Annual Conference on May 9-10 at the State Department of Health, Baltimore.

The building program of $2,500,000 for the Baltimore City Hospitals has been approved and work will soon be started on the new buildings, which will include a $450,000 nurses' home, a $220,000 tuberculosis ward, and several other hospital buildings.

Deaths

Dr. Abraham T. Cronk, Mount Airy, aged 67, died February 17 of septicemia.

Dr. Horace Bolivar Haddox, Gaithersburg, aged 63, died February 24 of heart disease.

Dr. Richard Caldwell Hume, Adamstown, aged 53, died March 1 of angina pectoris.

Dr. Alexander Ross Mackenzie, Capitol Heights, aged 65, died January 24.

MISSISSIPPI

Dr. Hugh H. Johnston, Vicksburg, has gone to the Mayo Clinic, Rochester, to take up a fellowship in otolaryngology.

Dr. F. G. Riley, Meridian, announces the opening of his Children and Maternity Hospital and Clinic. The building is especially constructed and equipped for the diagnosis and treatment of infants and children and for maternity cases.

Deaths

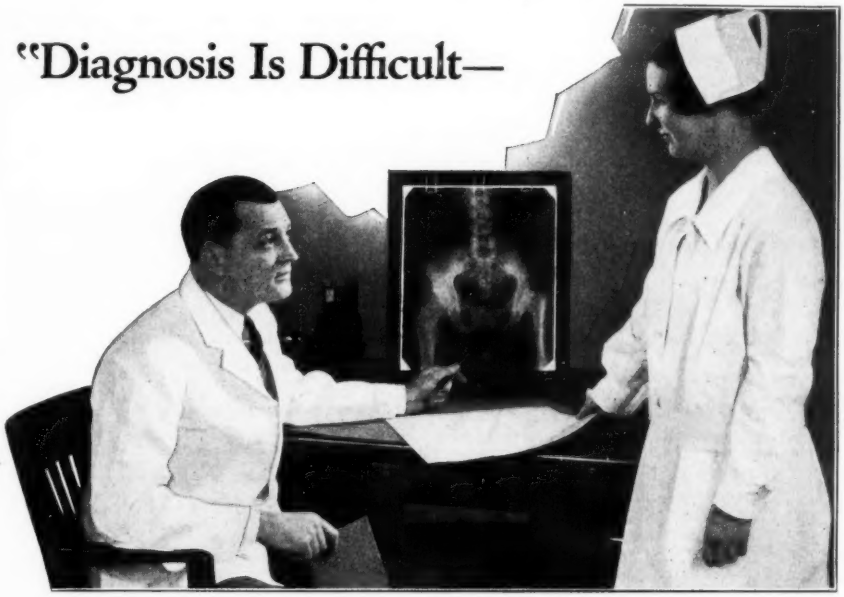
Dr. Josiah C. Brooks, Deeson, aged 75, died February 21.

Dr. Eugene Ray Gordon, McComb, aged 50, died February 18 of heart disease and nephritis.

Dr. Samuel Catlett James, Gulfport, aged 75, died

(Continued on page 36)

"Diagnosis Is Difficult—



I Wish to Confer with Doctor Johnson"

THE x-ray classifies your cases into two groups: those which are commonplace and simple, and those which are doubtful and difficult. The radiograph is the guide to a careful consideration of each influencing factor, point by point.

It is in the doubtful and difficult cases that the physician and radiologist should closely work together. Cooperation is necessary because each diagnostic factor must be completely considered from every angle—the clinical symptoms, the case history, the radiographic findings, each serves as a check on the others.

Eastman Dupli-Tized *Safety* X-ray Film, *Contrast*, is the ideal recording medium for all radiographic findings. The maximum detail and contrast so necessary in the x-ray examination are easily and completely recorded. It may be filed with the case history as it requires no more precautions in filing than a like quantity of paper records.

Eastman Kodak Company, *Medical Division*,
347 State Street, Rochester, N. Y.

Gentlemen:

I would like to receive your free "X-ray Bulletin," regularly.

Name .....

Street and Number .....

City and State .....

(Continued from page 34)

February 2 of carcinoma of the stomach and coronary sclerosis.

Dr. Charles Daniel Shipp, Big Creek, aged 67, died February 15 of cerebral hemorrhage.

MISSOURI

The Clinical Conference of the St. Louis Clinics, June 9-21, inclusive, instead of conducting postgraduate courses in the fields of medicine and surgery, will have a series of lectures, demonstrations, clinics and round table luncheon discussions on medical and surgical subjects of interest to the general practitioner, with practically all fields of medicine, surgery and allied subjects included, but the material will not be arranged in special courses. Clinicians of national and international prominence, upon invitation, will participate in the conferences.

Camden County Medical Society has elected the following officers: Dr. G. M. Moore, Linn Creek, President; Dr. E. G. Claiborne, Decaturville, Vice-President; Dr. G. T. Myers, Macks Creek, Secretary-Treasurer.

Newton County Medical Society has elected the following officers for 1930: Dr. J. A. Guthrie, Neosho, President; Dr. C. E. Maness, Neosho, Vice-President; Dr. J. R. Reynolds, Neosho, Secretary-Treasurer; Dr. J. L. Edmondson, Stella, Delegate; and Dr. R. F. Cheatham, Diamond, Alternate.

Ralls County Medical Society has elected the following officers: Dr. W. F. Botts, Center, President; Dr. T. J. Downing, New London, Secretary and Delegate.

Stoddard County Medical Society at their last meeting elected Dr. J. P. Brandon, Essex, President; Dr. W. H. Goad, Bernie, Vice-President; Dr. Frank LaRue, Dexter, Secretary; and Dr. W. C. Dieckman, Dexter, Treasurer.

Vernon-Cedar County Medical Society has elected for 1930 Dr. Forrest L. Martin, Nevada, President Dr. C. B. Davis, Walker, Vice-President; Dr. J. T. Hornback, Nevada, Secretary; Dr. E. H. Liston, Nevada, Delegate; Dr. J. W. Dawson, Eldorado Springs, Alternate.

Washington University School of Medicine will give a postgraduate course in internal medicine April 28 to May 24. The faculty for the course is made up from the Staff of the Department of Internal Medicine and visiting physicians of Barnes Hospital.

Dr. Walter H. Maddux, Kansas City, has been appointed Pediatrician-in-Charge of the children's clinic of Provident Hospital, Chicago. Having been awarded a fellowship by the Julius Rosenwald Fund, he will be able to take up graduate study at the University of Chicago.

Dr. George W. Becker, St. Louis, accepted an appointment as Chief Surgeon of the Police Department in February, succeeding Dr. Louis T. Pim, who will remain one of three assistant surgeons.

At a meeting of the Missouri Social Hygiene Association Board of Directors in St. Louis, February 26, the following committee chairmen were elected for the ensuing year: Dr. F. H. Ewerhardt, Education; Dr. Richard S. Weiss, Medical; Jacob M. Lashly, Public Relations; Mrs. Ira L. Bretzfelder, Protective Measures. The following were appointed directors of the Executive Committee: Dr. Ivan Lee Holt, Mrs. Virgil Loeb, Mr. Frank J. Bruno, Dr. Weiss and Dr. Ewerhardt. Rev. Alphonse M. Schwitalla, Dean of the St. Louis School of Medicine, is President of this Association.

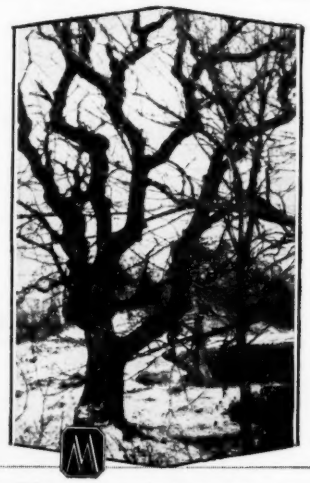
The new McMillan Eye, Ear, Nose and Throat Hospital and the Oscar Johnson Institute for Research, St. Louis, is now under construction. This building was made possible by the $1,200,000 grant from the General Education Board, the $1,000,000 bequest of Mrs. McMillan and the $500,000 gift of Mrs. Oscar Johnson and her sons.

The DePaul and the Deaconess Hospitals, St. Louis, one with a 250 bed capacity and the other 200, are nearing completion.

The Johnson-Rand Memorial Wing, which replaces the surgical wing of Barnes Hospital, St. Louis, cost

(Continued on page 38)

THE foundation of Calcreose is creosote — obtained from the wood of selected trees.



Tablets Calcreose 4 grs.

Each Tablet Calcreose 4 grains, contains 2 grains pure creosote combined with hydrated calcium oxide. The full expectorant action of creosote is provided in a form which patients will tolerate.

Compound Syrup of Calcreose

Available for the lesser ailments of the respiratory tract . . . a tasty, effective cough syrup that does not nauseate . . . each fluid ounce representing Calcreose Solution, 160 minims; Alcohol, 24 minims; Chloroform, approximately 3 minims; Wild Cherry Bark, 20 grains; Peppermint, Aromatics and Syrup q. s.

We suggest you also test Calcreose Tablets in the treatment of your elderly patients troubled with frequent and burning urination....2 tablets 4 times daily. Liberal sample of Tablets and Syrup gratis. The Maltbie Chemical Co., Newark, N. J.

MALTBIE Calcreose

THE · MALTBIE · CHEMICAL · COMPANY · NEWARK · NEW · JERSEY

DIET QUESTIONS have GELATINE ANSWERS

CAN THE BOTTLE BABY HAVE LESS STOMACH DISTURBANCE AND MORE BODY NOURISHMENT?

The answer to these two questions will be found in the same package.

It has been proved by medical research that the addition of 1% of Knox Sparkling Gelatine to the bottle baby's milk modifies the tendency of cow's milk to curdle in the natural acids and enzyme rennin of the infant stomach.

Not only does the gelatine lessen stomach disturbance but, in many cases, increases the absorption of the milk—enhancing the nourishment the infant obtains from its food.

Care should be taken, however, to use only real gelatine—the clear, unsweetened, unflavored, unbleached kind. For more than 40 years Knox Sparkling Gelatine has been regarded by the medical profession as meeting each of these requirements.

Be sure you specify Knox Gelatine—the *real* gelatine—when you prescribe gelatine for baby's milk.

The following is the formula prescribed by authorities in infant feeding: Soak, for about 10 minutes, one level tablespoonful of Knox Sparkling Gelatine in one-half cup of milk taken from the baby's formula; cover while soaking; then place the cup in boiling water, stirring until gelatine is fully dissolved; add this dissolved gelatine to the quart of cold milk or regular formula.

We have listed here some booklets which we believe will help you in your practice. Kindly mail the coupon today.

KNOX
is the real
GELATINE

KNOX GELATINE LABORATORIES
408 Knox Avenue, Johnstown, N. Y.

Please send me, without obligation or expense, the booklets which I have marked. Also register my name for future reports on clinical gelatine tests as they are issued.

- ☐ Varying the Monotony of Liquid and Soft Diets.
- ☐ Recipes for Anemia.
- ☐ Diet in the Treatment of Diabetes.
- ☐ Reducing Diet.
- ☐ Value of Gelatine in Infant and Child Feeding.

Name.....

Address.....

City.....

State.....

(Continued from page 36)

$825,000 and will contain 200 beds. The Radiology Institute, costing $450,000 and with an endowment of $640,000, is now under construction.

The Eiseman Memorial for convalescent and chronic cases to be five stories and contain 80 beds, has been planned by the Jewish Hospital, St. Louis. They have also planned to build a seven-story structure, the Waldheim Health Clinic, to cost $275,000.

Dr. Charles Harold Leslie, Kirkwood, and Miss Irene Birkenmayer, of Jerseyville, Illinois, were married November 27, 1929.

Deaths

Dr. Robert Haley, Brookfield, aged 70, died February 2 of chronic nephritis.

Dr. Charles A. Hinson, Kahoka, aged 62, died February 1 of carcinoma of the stomach.

Dr. Henry J. Kruse, St. Louis, aged 64, died in February of chronic myocarditis and chronic nephritis.

Dr. Harry C. Lee, a former resident and practitioner of Carrollton, aged 60, died at Trinidad, Colorado, January 12.

Dr. James Robert Lee, Charleston, aged 59, died February 5 of cerebral hemorrhage.

Dr. Arthur Lee Ludwick, Kansas City, aged 58, died March 2 of heart disease.

Dr. Eugene J. Neville, St. Louis, aged 62, died January 21 of carcinoma.

Dr. James Albert Reid, Wentzville, aged 59, died February 11 of cerebral hemorrhage.

Dr. Haynie Rowell, Kearney, aged 69, died February 14.

Dr. Walter William Vaughan, St. Louis, aged 66, died in February of otitis media and diabetes mellitus.

Dr. James Robert Wallis, Clinton, aged 68, died January 29.

Dr. Roy Wallace Whaley, Browning, aged 48, died December 17 of progressive spinal sclerosis.

NORTH CAROLINA

Deaths

Dr. Oscar Brent Baldwin, Sanford, aged 52, was found dead in bed February 8.

Dr. Isaac L. English, Faust, aged 72, died in February.

Dr. William J. Wallis, Brevard, aged 75, died February 16 of cerebral hemorrhage.

OKLAHOMA

Bryan County Medical Society has elected Dr. A. J. Wells, Calera, President; Dr. C. G. Price, Durant, Vice-President; Dr. James L. Shular, Durant, Secretary.

Caddo County Medical Society has elected Dr. I. S. Butler, Carnegie, President; Dr. Wade H. Vann, Cement, Vice-President; Dr. P. H. Anderson, Anadarko, Secretary-Treasurer.

Carter County Medical Society has elected Dr. F. P. von Keller, President; Dr. F. A. Harrison, Vice-President; Dr. R. C. Sullivan, Secretary-Treasurer; all of Ardmore.

Cleveland County Medical Society has elected Dr. Charles Rayburn, President; Dr. M. M. Wickham, Vice-President; Dr. B. H. Cooley, Secretary-Treasurer; all of Norman.

Comanche County Medical Society has elected Dr. P. A. Dunlap, President; Dr. H. A. Angus, Vice-President; Dr. L. W. Ferguson, Secretary-Treasurer; all of Lawton.

Craig County Medical Society has elected Dr. C. S. Neer, Vinita, President and Alternate; Dr. J. F. Walker, Grove, Vice-President; Dr. W. R. Marks, Vinita, Secretary; Dr. F. M. Adams, Vinita, Delegate.

(Continued on page 40)

A Dependable Agent for Supplying Calcium in Diffusible Form

KALAK WATER presents a saturate solution of calcium as the bicarbonate.

"Of the inorganic salts of calcium, the bicarbonate was the most effective in raising the blood calcium." (W. H. Jansen—Deut. Arch. f. klin Med. Oct. 1924.)

It is not possible to present calcium bicarbonate as a dry powder or as an effervescent mixture to be added to water. This salt can be maintained as the bicarbonate only in an aqueous solution that is charged with carbon dioxide.

KALAK WATER CO.
6 Church Street » » New York City

It's Sharp

BARD-PARKER has spared no effort to improve the detachable blade knife. Laboratory research—the best engineering brains—have both contributed in producing the razor sharp Bard-Parker blades used throughout the country every day.

Used Bard-Parker blades are readily replaced with new keen blades, eliminating the time and expense of resharpening, which is necessary with the one-piece scalpel. Always use a Bard-Parker knife for satisfactory results.

The New No. 7 Bard-Parker Handle—$1.
Blades, all sizes, six of one size per package—$1.50 per dozen. Write for complete circular.

BARD-PARKER COMPANY, INC.
369 Lexington Avenue, New York, N.Y.

Special Courses In Laboratory Technique

We have a six months' course for the training of laboratory technicians.

We have monthly courses for physicians. Special attention to the new Schilling Blood work.

Write for Information

Gradwohl School of Laboratory Technique

3514 Lucas Avenue,
St. Louis, Mo.

(Continued from page 38)

Custer County Medical Society has elected Dr. Gordon D. Williams, Weatherford, President; Dr. Frank H. Vieregg, Clinton, Vice-President; Dr. E. E. Darnell, Clinton, Secretary-Treasurer and Delegate.

Garvin County Medical Society has elected Dr. Hugh Monroe, Lindsay, President; Dr. L. P. Smith, Elmore City, Vice-President; Dr. John Calloway, Pauls Valley, Secretary-Treasurer; Dr. G. L. Johnson, Pauls Valley, Delegate; Dr. W. P. Greening, Pauls Valley, Alternate; Dr. T. C. Branum, Pauls Valley, Censor.

Greer County Medical Society has elected Dr. C. C. Shaw, Mangum, President; Dr. O. R. Jeter, Mangum, Vice-President; Dr. J. B. Hollis, Mangum, Secretary-Treasurer, reelected; Dr. G. Fowler Border, Mangum, Delegate.

Dr. George L. Johnson, formerly of Atlanta, Georgia, has been assigned Medical Officer-in-Charge of the U. S. Veterans' Hospital at Muskogee.

Dr. E. J. Rose, Medical Officer-in-Charge of the U. S. Veterans' Hospital at Muskogee, has been transferred to Washington as Chief of the Medical Division.

Dr. R. M. Shepard, formerly of Talihina, announces the opening of his office, 306 Medical Arts Building, Tulsa, for the diagnosis and treatment of diseases of the lungs.

Dr. E. A. Welch, formerly of Washington, D. C., has been assigned Clinical Director of the U. S. Veterans' Hospital at Muskogee.

Dr. William Ward Rucks, Jr., Oklahoma City, and Miss Louise Douglas Earthman, of Murfreesboro, Tennessee, were married December 10, 1929.

SOUTH CAROLINA

The South Carolina State Medical Association will hold its meeting at Florence May 6, 7 and 8.

Laurens County Medical Society has elected Dr. R. E. Hughes, Laurens, President; Dr. J. Lee Young,

(Continued on page 42)

ORGANOTHERAPY

can be effective only through the use of dependable endocrine products. The reputation and integrity of the manufacturer is the physician's only guarantee of reliability of those organotherapeutic products for which there is no chemical or biological assay. Every manufacturing process of all our products is supervised by our Analytical and Research Department.

DESSICATED PITUITARY BODY, U.S.P.
CORPUS LUTEUM
CORPUS LUTEUM AMPULES
PANCREATIN, U.S.P.
SOLUTION OF POST-PITUITARY
EPINEPHRIN
EPINEPHRIN AMPULES
SOLUTION OF EPINEPHRIN (1-1000)
DRIED SUPRARENALS, U.S.P.
DRIED THYROIDS, U.S.P.

Insure potency and constancy of action by prescribing the products of

G. W. CARNRICK CO.

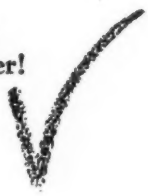
Manufacturers of Organotherapeutic Products

2-24 Mt. Pleasant Avenue, Newark, New Jersey

Milk Is Both a Great Food and a Great Danger! Retain the Great Food— Eliminate the Danger!

Prescribe Dryco—The Safe Milk

1. No danger of milk-borne typhoid!
2. No danger of milk-borne sore-throat!
3. No danger of milk-borne scarlet fever!
4. No danger of milk-borne diphtheria!
5. No danger of milk-borne tuberculosis!
6. No danger of milk-borne undulant fever!



Dryco Is Free From All Pathogenic Bacteria!

Let us send clinical data and samples of this milk.

Pin this to your Rx blank or letterhead and mail

THE DRY MILK COMPANY, Inc., 205 East 42nd St., New York, N. Y.

The results of twenty years' clinical experience in the foremost medical centers of this country, are your precedent for prescribing

OLEO-GOMENOL

in

CYSTITIS

℞ 5 to 15cc, by injection direct into the bladder.

C. R. BARD, Inc.

Exclusive Agents in the United States

79 Madison Ave. New York, N. Y.

The "MESCO" Laboratories manufacture the largest line of Ointments in the world. Sixty different kinds. We are originators of the Professional Package. Specify "MESCO" when prescribing Ointments. Send for lists.

MANHATTAN EYE SALVE COMPANY

Louisville, Kentucky

(Continued from page 40)

Clinton, Vice-President; Dr. R. L. Martin, Goldville, Secretary-Treasurer.

Marion County Medical Society has elected Dr. H. B. Webb, Nichols, President; Dr. R. B. Stith, Mullins, Vice-President; Dr. B. M. Montgomery, Marion, Secretary-Treasurer.

Oconee County Medical Society has elected Dr. J. S. Stribling, Seneca, President; Dr. E. A. Hines, Seneca, Secretary-Treasurer.

The Spartanburg General Hospital is making plans for enlarging the Hospital, such as building a new hospital for negroes, a new tuberculosis hospital, and a clinic building costing $34,000. Dr. J. M. Beeler is Superintendent of a Staff of thirty-four members of this Hospital.

Deaths

Dr. Robert Lusk Mayes, Newberry, aged 54, died February 23.

TENNESSEE

The Tenessee State Medical Association held its Centennial meeting in Nashville April 8-10, the State Association having been organized in Nashville in 1830, and has a record of continuous existence since its organization. Physicians of note from many parts of the Country were in attendance and on the program, among whom were Dr. Hugh S. Cumming, President of the Southern Medical Association and Surgeon General of the United States Public Health Service, Washington, and Dr. Olin West, General Manager of the American Medical Association, Chicago, a former member of the Tennessee State Medical Association. Dr. J. B. McElroy, Memphis, Tennessee, was elected President. Knoxville was chosen for the place of the next annual meeting.

Dyer-Lake-Crockett Counties Medical Society has elected Dr. W. W. Holland, Dyersburg, President; Dr. R. W. Griffin, Tiptonville (Lake County), Vice-President; Dr. E. S. Hopper, Alamo (Crockett County), Vice-President; Dr. E. H. Baird, Dyersburg, Secretary.

Greene County Medical Society has elected Dr. L. E. Coolidge, Greenville, President; Dr. C. E. Laughlin, Greenville, Vice-President; Dr. M. A. Blanton, Mosheim, Secretary-Treasurer.

Giles County Medical Society has elected Dr. E. M. Fuqua, Pulaski, President; Dr. F. C. Gaines, Pulaski, Vice-President; Dr. T. F. Booth, Pulaski, Secretary; Dr. G. D. Butler, Pulaski, Treasurer.

Hamblen County Medical Society has elected Dr. S. M. Ryburn, Morristown, President; Dr. H. G. Pangle, Russellville, Vice-President; Dr. P. L. Henderson, Morristown, Secretary-Treasurer.

Hardin-Lawrence-Perry-Wayne Counties Medical Society has elected Dr. J. H. Pickard, Hohenwald, President; Dr. J. H. Tilley, Lawrenceburg (Lawrence County), Vice-President; Dr. O. H. Williams, Savannah (Hardin-County), Vice-President; Dr. O. A. Kirk, Linden (Perry County), Vice-President; Dr. H. C. Boyd, Waynesboro (Wayne County), Vice-President; Dr. G. N. Springer, Hohenwald (Lewis County), Vice-President; Dr. C. C. Stockard, Lawrenceburg, Secretary-Treasurer.

Hickman County Medical Society has elected Dr. John S. Beasley, Centreville, President; Dr. W. K. Edwards, Centreville, Secretary.

Jackson County Medical Society has elected Dr. C. E. Reeves, Gainesboro, President; Dr. N. M. McCain, Gainesboro, Vice-President; Dr. L. R. Anderson, Gainesboro, Secretary.

Knox County Medical Society has elected Dr. Ralph R. Monger, Knoxville, President; Dr. M. S. Roberts, Knoxville, Vice-President; Dr. Jesse C. Hill, Knoxville, Secretary.

Maury County Medical Society has elected Dr. J. T. Hardison, Carters Creek, President; Dr. P. H. Faucett, Columbia, First Vice-President; Dr. Wallace Wilkes, Columbia, Second Vice-President; Dr. O. J. Porter, Columbia, Secretary.

Dr. George McSwain, Paris, will have associated with him at the McSwain Clinic Dr. C. D. Wilder, of

(Continued on page 46)

Which form of S. M. A. should be used . . . ?

The Powder and Concentrated Liquid Forms of S.M.A. have the same composition when diluted according to directions, and give equally good results in practice. Infants may be changed from one form to the other whenever conditions arise which make the other form more convenient.

Powder Form

Powder Form . . This form lends itself to the preparation of a small quantity at a time as in starting feedings, or in giving supplementary feedings. It is also convenient for preparing individual feedings where cooling facilities are not available, or for use in traveling.

❖ ❖ ❖

Concentrated Liquid Form ✱

Concentrated Liquid Form✱ . . This is the more simple form to prepare as it is already in liquid form. It is as simple as mixing two glasses of water. One container makes a liquid quart of S. M. A. ready to feed and should be used in cases where the infant is taking that amount of food in from one to two days. This form is very convenient in institutions where a large number of infants are being fed S.M.A. at one time. ✱Now available on the West Coast.

❖ ❖ ❖

Protein S.M.A. (Acidulated)

Protein S.M.A. (Acidulated) is indicated in cases of diarrhea, malnutrition, marasmus, premature infants and other infants needing a higher protein intake. It is very effective also during the course of mild infections such as pyelitis and otitis media.

Write us for samples and ask for our little tabulated informatian booklet No. 35, no obligation, of course.

THE LABORATORY PRODUCTS CO. © CLEVELAND, OHIO
In Canada: 64 Gerrard Street, East, Toronto, Ontario
West of Rockies: 437-8-9 Phelan Building, San Francisco, California

A-L HOUSE of SERVICE
VALUES!
SELECTION
CREDIT
SPEED
Service is
what Service Does!
When a concern is not satisfied until it has searched the corners of the Globe in order to provide Selections; when, through a Buying Power, it rises above the common markets to offer greater Values; when it unhesitatingly places confidence in the credit integrity of an ever-widening patronage; when it organizes, at tremendous cost to facilitate speed in delivery . . . it is emphasizing the only true interpretation . . .
Service is what service does!
This is the Spirit of this Institution.
Through this high conception of purpose we have grown . . . but the fullest measure of benefit is yours!
A.S.ALOE COMPANY
CHICAGO
ST. LOUIS
LOS ANGELES

No Variation

UNIFORMITY and accuracy of formulae are of primary importance in the successful use of Lactic Acid Milk. When Merrell-Soule Powdered Whole Lactic Acid Milk is used, you are assured of these factors even when the milk is prepared by an inexperienced person.

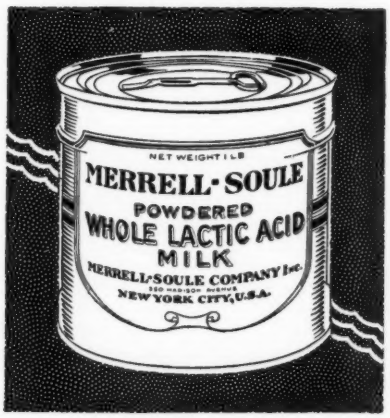
As the largest manufacturer of Powdered Lactic Acid Milk, the Merrell-Soule Co., Inc., employs every facility for scientific control, assuring absolute uniformity of acidity and fat content. Published analyses are strictly adhered to.

Physicians who are recommending Lactic Acid Milk for infant feeding will find Merrell-Soule Powdered Whole Lactic Acid Milk more satisfactory in every respect. It is a cultured milk and thus enjoys the advantages generally believed to be present due to the therapeutic value of the viable organisms themselves. It is more palatable than the ordinary acidified milk. Its powdered form makes for ease and accuracy in preparing the formula.

The Merrell-Soule Co., Inc., also manufactures Powdered Skimmed Lactic Acid Milk.

Literature and samples sent on request.

Merrell-Soule Co., Inc.,
350 Madison Avenue, New York



(Recognizing the importance of scientific control, all contact with the laity is predicated on the policy that KLIM and its allied products be used in infant feeding only according to a physicians formula)

Merrell-Soule Powdered Milk Products, including Klim, Whole Lactic Acid Milk and Protein Milk, are packed to keep indefinitely. Trade packages need no expiration date.

BACILLUS ACIDOPHILUS CULTURE
(B. A. CULTURE)

B. B. CULTURE and B. A. CULTURE provide a complete service to the user of lactic cultures. Each Culture has its own well defined field of usefulness.

Our conveniently located depository stores throughout the South are prepared to serve you.

B. B. Culture Laboratory, Inc.
Yonkers, N. Y.

In Prenatal Care

For the good of both mother and child, a safe diet is needed which provides the elements for body building, especially for sound bone and tooth formation, without impoverishment of the mother's own organism. Essential also is the energy fuel needed to sustain the mother's strength and vitality.

For a food rich in vitamins and minerals . . . . . .
For the vital building elements of whole milk, wheat and barley . . . . . .
For a delicious beverage, refreshing to the expectant mother . . . . . .

THE ORIGINAL MALTED MILK
HORLICK'S
Samples and literature sent upon request
Horlick's Malted Milk Corp. Racine, Wis.

(Continued from page 42)

Orlando, Florida, as an eye, ear, nose and throat specialist.

Dr. V. K. Earthman, of Shelbyville, has moved to Murfreesboro. He confines his practice to eye, ear, nose and throat.

Deaths

Dr. Giles Christopher Savage, Nashville, aged 76, died April 8 of pneumonia.

Dr. William Bowen, Memphis, aged 68, died February 7.

Dr. Joshua Meek Hamilton, Shawnee, aged 56, died February 12.

Dr. Mark Mitchell Jetton, Memphis, aged 41, died March 4 of heart disease.

Dr. George Leonard Landis, Nashville, aged 83, died February 21 of heart disease.

Dr. William E. Minton, Johnson City, aged 70, died February 19.

Dr. Joseph Russell Tarpley, Nashville, aged 47, died February 18 of cerebral hemorrhage.

Dr. William Henry Taylor, New Market, aged 75, died January 24 of carbuncle.

Dr. Lyle West, Chattanooga, aged 36, was killed in an airplane crash on February 24.

Dr. Netta May Waite, Chattanooga, aged 61, died February 3 of heart disease.

TEXAS

Angelina County Medical Society has elected Dr. T. A. Taylor, President; Dr. L. H. Denman, Vice-President; Dr. O. P. Gandy, Secretary, reelected; all of Lufkin.

Bell County Medical Society has elected Dr. L. R. Talley, President; Dr. Rudulph K. Harlan, Vice-President; Dr. M. W. Sherwood, Secretary-Treasurer, reelected; all of Temple.

Eastland County Medical Society has elected Dr. F. E. Clark, Cisco, President; Dr. W. L. Jackson, Ranger, Vice-President Dr. J. H. Caton, Eastland, Secretary-Treasurer, reelected.

Galveston County Medical Society has elected Dr. W. A. Hyde, President; Dr. H. O. Sappington, Vice-President; Dr. S. S. Templin, Secretary-Treasurer; all of Galveston.

Kaufman County Medical Society has elected Dr. W. F. Alexander, Terrell, President; Dr. John W. Neely, Terrell, Vice-President; Dr. D. H. Huggins, Forney, Secretary-Treasurer, reelected.

McCulloch County Medical Society has elected Dr. Conrad Frey, Melvin, President; Dr. P. A. Baze, Mason, Vice-President; Dr. J. E. Powel, Brady, Secretary-Treasurer.

Taylor County Medical Society has elected Dr. Grady Shytles, President; Dr. Hugh B. Tandy, Vice-President; Dr. C. E. Adams, Secretary-Treasurer; all of Abilene.

Tarrant County Medical Society has elected Dr. M. E. Gilmore, President; Dr. L. H. Reeves, President-Elect; Dr. R. J. White, Vice-President; Dr. W. G. Phillips, Secretary-Treasurer; all of Fort Worth.

The Roberts Hospital, Paris, founded by the late

(Continued on page 50)

CLASSIFIED ADVERTISEMENTS

TECHNICIANS are in demand. We are successfully training laboratory and x-ray workers. Send us your assistant and we will return you a competent technician. If you are in immediate need of a well-trained helper, write or phone. Full information upon request. Alabama Pathological Laboratory, Birmingham, General Hospital, Birmingham, Ala.

DRUG AND ALCOHOLIC PATIENTS are humanely and successfully treated in Glenwood Park Sanitarium, Greensboro, N. C.; reprints of articles mailed upon request. Address W. C. Ashworth, M.D., Owner, Greensboro, N. C.

Patient Types . . .

The Elderly Patient

It is often a task to keep an elderly patient in active service. Constipation may be the borderline between invalidism and good health. Cathartics are particularly harmful in such a case but Petrolagar and "Habit Time" will help the senile bowel to normal function.

Petrolagar is composed of 65% (by volume) mineral oil with the indigestible emulsifying agent, agar-agar.

Petrolagar

Petrolagar Laboratories, Inc.
536 Lake Shore Drive, S.O. 5
Chicago, Ill.

Gentlemen:—Send me copy of "HABIT TIME" (of bowel movement) and specimens of Petrolagar.

Dr.....

Address.....

.....

Anemia Successfully Treated with a Food-Iron Concentrate

ORDINARY iron tonics and pills are not well utilized in making hemoglobin. On the other hand, while spinach and other greens are a most wholesome source of blood iron, the difficulty is to induce delicate patients to eat enough to supply the body's needs.

The solution of the problem appears to lie in the direction of a food-iron concentrate, in which *definite* and *increased* amounts of iron are presented in *soluble* and *assimilable* form.

That is the reason for the clinical success of

Food-Ferrin

Food-Ferrin is a natural and physiologic source of iron. In it is found the concentrated soluble substance of a mixture of greens. It is not a medicine, but a highly efficient blood-building food.

Laboratory and clinical investigation have amply confirmed its value in the treatment of anemia. It is agreeable to taste, never disturbs but aids digestion, does not injure the teeth, and never causes constipation.

So that you can make a clinical test of Food-Ferrin, we would like to send you a physicians' sample with our compliments. The coupon is for your convenience.

Mail Us This Coupon Today

The
BATTLE CREEK FOOD COMPANY
Dept. SMJ-5, Battle Creek, Michigan

Send me, without obligation, a supply of Food-Ferrin for clinical trial.

NAME (Write on margin below.) ADDRESS

for

ERADICATING

MALARIA

TO rid the malarial patient of infection it is essential to destroy both the schizonts which are chiefly responsible for the attacks and the gametes or sexual forms which transmit the disease through the mosquito. While quinin is destructive to the former, it has but a limited action upon the latter. For this reason chemists and research investigators have long sought an antimalarial agent that would be effective against all types of plasmodia. This aim has been finally attained by

PLASMOCHIN

TRADEMARK REG. U. S. PAT. OFF.

Brand of AMINOQUIN

Extensive tests in all parts of the world have demonstrated the outstanding efficiency of Plasmochin in the treatment of malaria. According to Manson-Bahr, an international authority on tropical diseases, it has a remarkable specific action on the benign tertian and the quartan parasites and destroys the gametes long before the schizonts. Plasmochin is usually given in combination with small doses of quinin (Plasmochin Compound). For cases of quinin idiosyncrasy, late pregnancy and blackwater fever, Plasmochin (plain) is also available without such addition.

HOW SUPPLIED: Plasmochin (Plain) in tablets of 1/3 grain (bottles of 25). Plasmochin Compound in tablets of 1/6 grain with 2 grains of quinin sulphate (bottles of 50).

For detailed information, write for special pamphlet

WINTHROP CHEMICAL COMPANY, INC.

170 Varick St., New York — Windsor, Ont., Canada

WINTHROP

Winthrop Quality has no substitute

121M

Allison Has Specialized In Quality Wood Furniture For Almost A Half Century

Quiet, restful surroundings minimize the tension of active days. Comfortable, attractive wood furniture by ALLISON . . . complete for reception room, business office and treatment room, eases the body and releases the mind to keener and more direct thinking.

CATA-SENT REQ-

LOG ON UEST.

Sold By All Reliable Dealers.

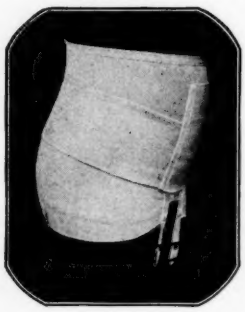
Only The Best Is Good Enough.

MANUFACTURERS OF W. D. ALLISON COMPANY Physicians Office Furniture INDIANAPOLIS

1131 Burdsal Pk'w'y. Indianapolis

"A word fitly spoken—how good!"
This word came yesterday from a distinguished M.D.
—"The Storm has been tried and proven."

"STORM"



The New "Type N" Storm Supporter

meets demands of present styles in dress.

Long special laced back extension of soft material low on hips.

Hose supporters attached.

Takes Place of Corsets

Adaptable to Pregnancy, Ptosis, Hernia, Obesity, Sacro-Iliac Relaxation, High and Low Operations, etc.

Ask for Literature

Each belt made to order in 24 hours

KATHERINE L. STORM, M.D.

Originator, Owner and Maker

1701 Diamond Street Philadelphia

(Continued from page 46)

Dr. Turner F. Roberts in July, 1926, was reopened by his son, Dr. Archie M. Roberts, on February 1. Dr. Roberts recently completed a course in eye, ear, nose and throat at New Orleans.

Deaths

Dr. Leonard Thomas Batte, Belton, aged 72, died January 6, following an operation for appendicitis.

Dr. Orville H. Kirkpatrick, McKinney, aged 90, died in February.

Dr. William Edwin Luter, San Antonio, aged 61, died February 16 of cerebral hemorrhage.

Dr. Edward Oscar Moore, Midlothian, aged 69, died February 4 of myocarditis.

Dr. David S. Rumph, Fort Worth, aged 54, died January 14 of pneumonia.

Dr. Edward L. Seay, Denison, aged 56, died January 31.

VIRGINIA

The Staff announces the opening of the Southern Orthopedic Hospital at 2112 Monteiro Avenue, Richmond. Dr. Thomas F. Wheeldon is Chief of Staff.

Lee County Medical Society has elected Dr. J. B. Muncy, Pennington Gap, President, to succeed Dr. P. D. Pence, deceased. Dr. W. J. Innes, Pennington Gap, was reelected Secretary.

Dr. L. E. Cockrell, Reedville, has been appointed Acting Assistant Surgeon of Public Health Service by the Federal Government.

Dr. Charles H. Peterson, who was Instructor in Roentgenology at the University of Virginia, Department of Medicine, has moved to Roanoke and is now Roentgenologist at Jefferson Hospital.

Dr. L. F. Hansbrough, Front Royal, has been elected a member of the Board of Directors of the recently reorganized Associated Charities of Front Royal of Warren County.

The Children's Memorial Clinic, Richmond, elected Dr. Manfred Call, President, and Dr. Beverley R. Tucker, Vice-President.

Dr. George A. L. Kolmer, formerly Director of Public Health at Salem, has been promoted to the grade of Major in the 305th Medical Regiment, Reserve Corps.

Dr. Lee Edwards Sutton, Richmond, and Miss Ruth Rogan McClellan, of New York City, were married February 8.

Deaths

Dr. Alpheus Fields, Norfolk, aged 62, died February 4.

Dr. Chas. Wm. Greener, Tazewell, aged 78, died February 13 of myocarditis.

Dr. John M. Harwood, Petersburg, aged 41, died February 12.

Dr. Robert Bruce James, Lexington, aged 69, died suddenly March 3 of heart disease.

Dr. Richard Randolph Nevitte, Temperanceville, aged 58, died January 17.

WEST VIRGINIA

The West Virginia State Medical Association will hold its sixty-third annual meeting at White Sulphur Springs on May 20-22.

Summers County Medical Society has elected Dr. J. F. Bigony, Hinton, President; Dr. A. P. Hudgins, Hinton, Secretary-Treasurer, reelected.

Raleigh County Medical Society has elected Dr. A. U. Tieche, Beckley, President; Dr. A. H. Bowles, Glen White, First Vice-President; Dr. Ross P. Daniel, Pemberton, Second Vice-President; Dr. W. W. Koiner, Beckley, Secretary-Treasurer.

Dedication of the Golden Memorial Heart Clinic was held on March 14 at the Davis Memorial Hospital, Elkins. The dedication program consisted of a demonstration of spinal anesthesia in major surgery, laboratory demonstrations, demonstration of case exhibits, roentgenological and cardiographic exhibits, motion pictures, lantern slides, and general discussion of cardiac conditions.

Dr. M. C. Borman, of Montgomery, who has been President of the Fayette County Medical Society, left about April 1 to locate in Milwaukee, Wisconsin.

CAPROKOL

Affords Quick Relief in Urinary Infections

It does not irritate the bladder mucosa even when given in maximum doses and is equally effective in acid or alkaline urine.

Indicated in the treatment of

Pyelitis—acute or chronic

Cystitis—acute or chronic

Urethritis—specific or non-specific

Secondary Infections—associated with prostatitis or distant foci of infection

Valuable as a prophylactic before and after instrumentation and operation.

Capsules for adults *Solution for children*

SHARP & DOHME

BALTIMORE

New York Chicago New Orleans St. Louis Atlanta Boston
Philadelphia Kansas City San Francisco Dallas

In Rickets, Tetany and Osteomalacia

MEAD'S

VIOSTEROL

IN OIL 100 D ORIGINALLY ACTEROL

AMERICAN PIONEER STANDARDIZED ACTIVATED ERGOSTEROL

② The clinical experience which safely settled the question of activated ergosterol dosage was obtained under fellowships established by Mead Johnson & Co., at five leading universities. This rich experience is behind every bottle of Mead's Viosterol in Oil, 100 D (originally Acterol)—the American Pioneer—Council-accepted.

Specify the American Pioneer Product—
MEAD'S Viosterol in Oil, 100 D—
Mead Johnson & Co., Evansville, Indiana

The Modification of Powdered Milks Governed by the Same Rules as Cow's Milk

When physicians are confronted with undependable fresh milk supplies in feeding infants, it is well to consider the use of reliable powdered whole milks such as Mead's or the well-known Klim brand. Such milk is safe, of standard composition, and is easily reliquefied.

Under these conditions, Dextri-Maltose is the physician's carbohydrate of choice just as it is when fresh cow's milk is employed.

The best method to follow is first to restore the powdered milk in the proportion of one ounce of milk to seven ounces of water, and then to proceed building up the formula as usual.

DEXTRI-MALTOSE NOS. 1, 2 AND 3, SUPPLIED IN 1-LB. AND 5-LB. TINS AT DRUGGISTS. SAMPLES AND LITERATURE ON REQUEST. MEAD JOHNSON & CO., EVANSVILLE, IND., U.S.A.

The PHYSICIAN'S POLICY *is* MEAD'S POLICY

Besides producing dependable Infant Diet Materials such as Dextri-Maltose, and maintaining a model laboratory devoted exclusively to research, Mead Johnson & Company for years have been rendering physicians distinguished service by rigidly adhering to their well-known policy, namely:

> "Mead's Infant Diet Materials are advertised only to physicians. No feeding directions accompany trade packages. Information in regard to feeding is supplied to the mother by written instructions from her doctor who changes the feedings from time to time to meet the nutritional requirements of the growing infant. Literature is furnished only to physicians."

Every physician would do well to bear in mind that in this commercial age, here is one firm that instead of exploiting the medical profession, lends its powerful influence to promote the best interests of the medical profession it so ably serves.

Dextri-Maltose for Modifying Lactic Acid Milk

In using lactic acid milk for feeding infants, physicians find Dextri-Maltose the carbohydrate of choice:

To begin with, Dextri-Maltose is a bacteriologically clean product, unattractive to flies, dirt, etc. It is dry, and easy to measure accurately.

Moreover, Dextri-Maltose is prepared primarily for infant-feeding purposes by a natural diastatic action.

Finally, Dextri-Maltose is never advertised to the public but only to the physician, prescribed by him according to the individual requirements of each baby.

DEXTRI-MALTOSE NOS. 1, 2 AND 3, SUPPLIED IN 1-LB. AND 5-LB. TINS AT DRUGGISTS. SAMPLES AND LITERATURE ON REQUEST. MEAD JOHNSON & CO., EVANSVILLE, IND., U.S.A.

In Rickets, Tetany and Osteomalacia

MEAD'S

VIOSTEROL

IN OIL, 100 D ORIGINALLY ACTEROL

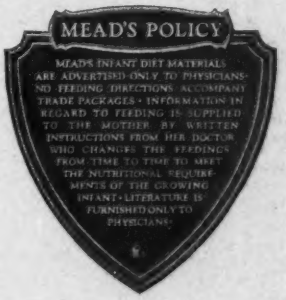
AMERICAN PIONEER STANDARDIZED ACTIVATED ERGOSTEROL

③ **Because of our long experience, Mead's Viosterol in Oil, 100 D, does not turn rancid in properly closed containers. We were first in America to produce pure ergosterol and also to standardize activated ergosterol. Mead's Viosterol (originally Acterol) is admittedly the pioneer that set the now accepted standards of safe potency and dosage.**

Specify the American Pioneer Product—
MEAD'S Viosterol in Oil, 100 D
Mead Johnson & Co., Evansville, Indiana

"Hold Fast to That Which is Good"

The Mead Policy that for years has proved itself professionally and economically valuable to physicians who feed infants also applies to Mead's Viosterol in Oil, 100 D (originally Acterol). As with Dextri-Maltose, we feel that Mead's Viosterol is a part of the physician's armamentarium, to be prescribed by him alone. Therefore, we refrain from lay advertising of Mead's Viosterol or any other Mead Product; furthermore, we do not print dosage directions on the bottle, on the carton or in a circular. "Hold fast to that which is good" —the Mead Policy, Dextri-Maltose and Mead's Viosterol (originally called Acterol).


MEAD'S POLICY
MEAD'S INFANT DIET MATERIALS ARE ADVERTISED ONLY TO PHYSICIANS. NO FEEDING DIRECTIONS ACCOMPANY TRADE PACKAGES. INFORMATION IN REGARD TO FEEDING IS SUPPLIED TO THE MOTHER BY WRITTEN INSTRUCTIONS FROM HER DOCTOR WHO CHANGES THE FEEDINGS FROM TIME TO TIME TO MEET THE NUTRITIONAL REQUIREMENTS OF THE GROWING INFANT. LITERATURE IS FURNISHED ONLY TO PHYSICIANS.

MEAD JOHNSON & CO., Evansville, Ind., U.S.A.

VENTRICULIN

for . . . PERNICIOUS ANEMIA

A principle from stomach tissue that stimulates hematopoiesis

. . . VENTRICULIN is palatable; it is to be taken with the meals—has an agreeable meaty flavor and is well tolerated on long continued use. Very efficient and at the same time economical.

Each lot is clinically tested in pernicious anemia cases.

An organization devoted to the study of pernicious anemia, the Thomas Henry Simpson Memorial Institute for Medical Research, University of Michigan, receives samples of each lot of Ventriculin for clinical testing. No lot is released by us for general use until it has been definitely certified as efficient in actual cases of pernicious anemia.

How Supplied:
Ventriculin is supplied in 10-gram vials only, 12 and 25 in a package.

PARKE, DAVIS & COMPANY

DETROIT, MICHIGAN

NEW YORK . KANSAS CITY . CHICAGO . BALTIMORE . NEW ORLEANS . ST. LOUIS
MINNEAPOLIS . SEATTLE *In Canada:* WALKERVILLE . MONTREAL . WINNIPEG